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DEPARTMENTAL PROCESSING: A NEW LINE FOR DP

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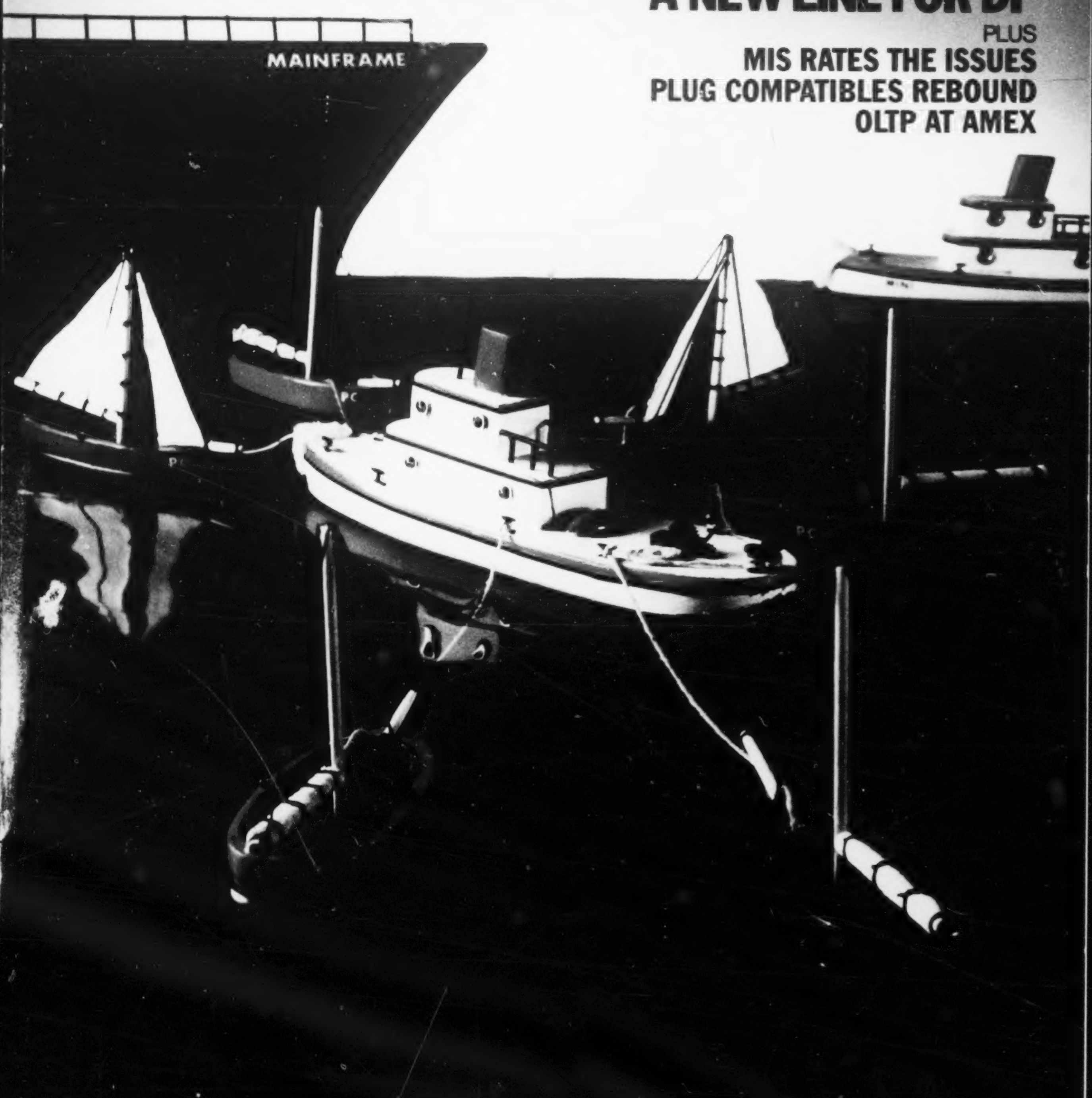
OLTP AT AMEX


MAINFRAME
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DATAMATION

NOVEMBER 15, 1986/$3 U.S.A.
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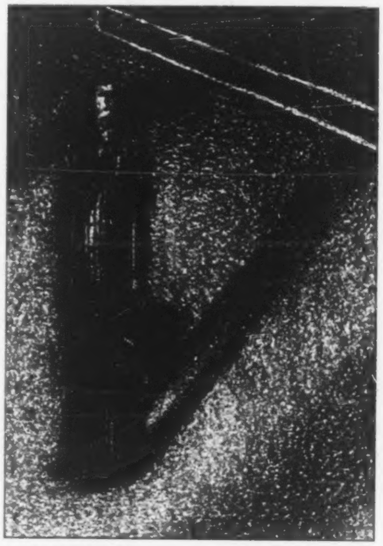

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Cahners Publishing Company, A Division of Reed Publishing USA. Specialized Business and Consumer Magazines for Building & Construction, Interior Design, Electronics & Computers, Foodservice & Lodging, Manufacturing, Book Publishing & Libraries, Medical/Health Care, Child Care & Development.

Our annual survey shows oems and vars are selling more systems and making less money.

MORE FOR LESS

by Edith Holmes

The year 1985 was a banner one for end users looking for bargains in small systems; for them, the industry slump paid off by bringing prices down. But original equipment manufacturers and value-added resellers weren't thrilled: they had to sell more computers and peripherals to meet their revenue goals.

These general conclusions are spelled out in a recently released survey of the oem/systems house market. To a large extent, the current year is little changed from the last. The annual survey by Technical Publishing Co., publisher of DATAMATION, shows that while the number of oems and vars participating in its study jumped from 2,011 to 4,256 firms, a 112% increase, the value of the systems they sold grew only 34%. For the majority of the companies in this market, the average value of each system sold fell more than $9,500.

The survey—which represents roughly 75% of the total domestic oem/systems house market—also shows that in 1985 IBM stole the march on Digital Equipment Corp. in a minicomputer market that shrank 16% (see Fig. 1). In the meantime, IBM continued to outdistance its competition in the booming oem micro market—a field that grew 71.6% (see Fig. 2).

In 1985, the 4,256 firms included in Technical's 1986 edition of the *Directory of Systems Houses and Computer Oems* sold 233,893 computer systems for $5.1 billion. A year earlier, the directory listed 2,011 companies selling 155,574 systems for $3.8 billion. The doubling of the survey's database makes many direct comparisons between 1984 and 1985 data unwise, if not impossible. It isn't possible, for example, to determine what improvement 1985 oem sales achieved over those in 1984.

But the average system price of $21,804 in 1985, compared with $24,426 in 1984, suggests that last year the industry's integrators and resellers could not afford to sit back and wait for customers to come to them.

Indeed, other data indicate that many of these firms saw the value of the systems they sold drop far more than $2,622 between 1984 and 1985. Hardware/product oems and systems houses and integrators—companies that in Technical's survey account for 78% of the value of the systems sold, or nearly $4 billion, and 58% of the systems sold, some 135,658 computers—sold their products for $9,585 less last year than they did the year before.

Representing 22% of the survey sample, dealers, distributors, and commercial oems did better, actually increasing the average value of the systems they sold by $2,085. Software distributors and oems, 20% of those surveyed, raised the value of their products by $160.

SAME STATES IN LEAD

The geographic distribution of those surveyed remained the same at the top from one year to the next, with California holding on to 18.1% of these oems and vars. New York kept its number two position, with 9% of these firms calling the Empire State home. Massachusetts slipped to fifth place from third, hanging on to 5% of the resellers polled, while Texas took over as number three with 6.2% and New Jersey came in fourth with 5.4%.

In general, the Midwest and Midatlantic posted losses of oems and vars. Among these states are Virginia, Maryland, Pennsylvania, Ohio, Illinois, and Minnesota. Florida showed a gain—to 4.5% of the companies surveyed in 1985 from 3.2% in 1984.

In still another measure of the health of the oem market, the rate of new resellers entering the field remains low. Despite the larger sample size, fewer new companies started up in 1985 than in the previous nine years. Only 162 firms were formed last year. Further, the rate of expansion for this segment of the industry has dropped steadily to 4% today from a high of 20.2% in 1978.

The survey's assessment of systems houses and oems by size suggests that much of the increase in the database is in small companies with sales under $10 million and staffs of 50 or fewer employees. Nearly 92% of the firms in the survey sample report revenues of less than $10 million, and 88.5% have staffs of 50 or less.

In fact, the greatest growth in the industry, according to the survey, is in firms earning $1 million or less annually. The number of companies in this category grew to 58% from 46%. Oems and vars in the $1.1 million to $10 million category and in the $10.1 million to $100 million category lost 5.2% and 6.8%, respectively.

Over half of the survey sample (55.2%) have 10 or fewer employees. Another 23.3% of the sample have between 11 and 25 employees.

An examination of the end-user markets served by oems and vars shows a rise in the number of these companies selling to the construction industry, to 7.3% in 1986 from 3.4% in 1985. Similarly, finance, insurance, and real estate markets were customers of 11.3% of the resellers in last year's survey, compared with 17.2% this year.

Downturns appear in the number of oems and vars selling to manufacturers (to 14.3% from 19.4%), retailers (to 6.7% from 9%), and public administrators (to 3.5% from 6%). Services also fell sightly, to 31% from 34.3%.

Again, all of these data must be

Bridalveil Fall, Yosemite National Park, California c. 1927
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SOME OF THE GREATEST THINGS IN AMERICA NEVER CHANGE. SOME DO.

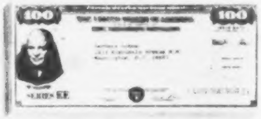

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FIG. 1

MINICOMPUTER SALES VIA OEMS

	PERCENT SHARE OF MINICOMPUTERS SOLD VIA SYSTEMS HOUSES/OEMs				
MANUFACTURER	**1981**	**1982**	**1983**	**1984**	**1985**
ADDS	—	—	—	—	1.3
AT&T	—	—	—	—	1.9
Burroughs	—	—	—	—	1.1
Data General	21.5	11.5	6.1	3.4	4.3
Datapoint	4.2	4.1	3.0	1.3	1.1
Digital Equipment	48.4	42.8	28.4	39.4	28.9
Hewlett-Packard	6.0	7.2	3.9	1.6	3.3
IBM	3.2	4.7	14.5	28.4	31.0
Motorola/Four Phase	—	—	—	—	2.4
Prime	1.5	11.0	1.4	1.6	2.0
Sperry Univac	—	—	—	—	1.1
Texas Instruments	1.8	5.5	2.3	3.8	6.0
Wang Laboratories	—	—	3.9	3.1	1.7
All others	10.9	11.8	26.9	14.9	13.9
Total Sample (units shipped)	**14,463**	**13,440**	**20,424**	**40,567**	**34,084**

FIG. 2

PERSONAL COMPUTER SALES VIA OEMS

	PERCENT OF PERSONAL COMPUTERS SOLD VIA SYSTEMS HOUSES/OEMs				
MANUFACTURER	**1981**	**1982**	**1983**	**1984**	**1985**
Altos Computer	—	4.9	4.6	3.2	5.3
Apple	37.9	20.3	4.9	7.1	6.6
AT&T	—	—	—	—	3.6
Atari	—	—	—	—	2.1
Bondwell	—	—	—	—	2.5
Columbia	—	—	—	—	1.0
Commodore	6.5	5.4	10.3	10.0	1.8
Compaq	—	—	—	—	3.2
Convergent Technologies	—	—	—	—	1.4
Corona Data Systems	—	—	3.5	2.2	1.9
Cromemco	2.1	2.4	4.9	2.4	1.1
Digital Equipment	—	1.0	11.4	6.2	2.9
Hewlett-Packard	—	—	1.0	1.1	1.3
IBM	3.7	11.3	9.1	21.4	32.8
ITT Information Systems	—	—	—	—	1.8
Leading Edge	—	—	—	—	1.6
Sanyo	—	—	—	—	1.8
Sperry Univac	—	—	—	—	1.1
Televideo	—	3.5	8.5	4.9	4.0
Texas Instruments	—	3.3	4.3	5.7	1.4
Wang Laboratories	—	—	—	4.0	1.1
Wyse Technology	—	—	—	—	1.1
Zenith	—	—	—	1.2	5.2
All others	40.9	36.2	21.1	12.8	13.4
Total Sample (units shipped)	**21,750**	**36,792**	**67,732**	**115,007**	**197,346**

evaluated with care, since this year's survey includes many new end-user markets not covered before. No less than 37 of the 77 listed industries are new.

Because more than twice the number of companies responded to Technical's survey in 1985, it is not possible to determine either the fastest-growing or fastest-shrinking end-user markets. Overall, however, general business/accounting and specialized business/accounting applications account for fewer of the total systems sold last year than they did the year before (see Fig. 3), yet they still account for nearly

Biggest news of the survey is the 10-point drop in Digital's share of the oem minicomputer marketplace.

half (46.2%) of all applications. Some of this drop may be owed to the bigger survey base and the addition of new group and subgroup categories not included before, such as the scientific and systems tools listings.

Together with office automation applications, business and accounting are still on top (see Fig. 4). Gains for office automation may reflect the fact that word processing is finally being implemented by big corporations. The drop in earth resources applications may reflect the problems being experienced by the oil industry.

Perhaps the biggest news from this year's survey is the 10-point drop in Digital Equipment Corp.'s share of the oem minicomputer marketplace, despite the increased sample size (see Fig. 1). In the meantime, IBM's market share rose three points to take first place with 31%.

The oem minicomputer game still belongs to these two vendors, however. The survey shows a minor reshuffling in rank for the other manufacturers of these computers. Texas Instruments is Digital Equipment's and IBM's nearest competitor with a 6% share of the market. Wang Laboratories' share dropped by nearly half to 1.7%.

IBM continues to lead in microcomputer sales to oems and vars, as well, expanding its market share to 32.8% in 1985 from 21.4% in 1984 (see Fig. 2). Zenith is the only other company to post an increase in share—to 5.2% from 1.2%. Zenith's performance may be owed in large part to the massive federal government contracts it has won in the past three years.

The 11 companies new to the list of oems and vars selling personal computers—among them AT&T, Compaq, and Leading Edge—managed to capture 21.2% of this market in 1985. All told, they sold more than 41,000 systems, enough to rouse IBM: recent IBM product introductions, notably the 286 XT, confirm the impression that the clone makers have captured Big Blue's attention.

FIG. 3

TOTAL VAR MARKET BY BROAD APPLICATION CATEGORIES—1985

	PERCENT OF TOTAL SYSTEMS SHIPPED			
MARKET	**1982**	**1983**	**1984**	**1985**
General Business Accounting	35.58	28.04	31.47	16.39
Specialized Business Accounting	27.22	23.67	23.46	15.83
Office Automation/Productivity	8.69	7.80	8.25	9.78
Manufacturing Production	11.81	14.03	13.42	13.20
Industrial Automation	4.88	6.40	4.86	4.25
Design Automation	.75	.99	1.13	3.84
Earth Resources	2.09	1.66	1.87	1.55
Scientific	*	*	*	2.92
Real-Time Data Acquisition & Control	2.22	2.53	1.89	3.51
Graphics	1.58	2.04	1.98	3.20
Communications	6.73	7.71	6.67	11.65
Health/Medical Services	.41	1.97	.88	2.84
Laboratory	1.67	1.53	1.39	2.29
Computer Aided Publishing	.32	.34	.35	1.77
Systems Tools	*	*	*	4.39
Other Applications	2.05	2.29	2.38	2.59
Total Systems	**171,236**	**171,842**	**155,574**	**233,893**

*Not included in previous years

FIG. 4

TOP APPLICATIONS FOR VARS—1985

APPLICATION	**1985 UNIT SHIPMENT**
Word Processing	308,242
General Ledger	305,654
Accounts Receivable	302,482
Accounts Payable	300,582
Billing/Invoicing	295,028
Payroll	292,099
Database Management	291,743
Order Entry	289,181
Spreadsheets	274,047
Sales Analysis/Forecasting	264,133
Integrated (wp, DBMS, ss)	246,009
Electronic Mail	230,563
Graphics	228,404
Management Information Systems	222,951
Inventory Control	213,966

SEVERAL NEW FIRSTS

In addition to the doubled database, this year's survey includes several other "firsts"—answers to questions that haven't been asked before in the eight-year history of the systems house and computer oem directory. Asked to classify the systems they sold in 1985, for example, a healthy majority of the 4,256 companies responding (61.3%) list multiuser and standalone microcomputers.

This figure lends weight to the generally accepted notion that the third-party channel is, first and foremost, an outlet for micros. These data also may reflect the increasing focus of the entire industry on the desktop. Less than one third of the surveyed firms sold anything bigger. Only 15.6% of these companies indicate they sold minicomputers, and just 11.7% report sales of superminis.

Technical workstations, too, have yet to be marketed in a big way through this channel; only 8.3% of the oems and vars polled sold them. Similarly, at the low end of the spectrum, just 3.1% of the responding companies say they market board computers.

When asked—for the first time in the directory's history—to describe the systems they sold last year, the responses of those surveyed form a pyramid. Corporate resource computers serving more than 128 users and costing in excess of $1 million are at the top, and work group and single-user

FIG. 5

PERIPHERALS SALES VIA OEMS

TYPE OF PERIPHERAL	QUANTITY SOLD VIA OEMS 1982	1983	1984	1985	% CHANGE
PRINTERS					
Serial: Dot matrix	68,994	82,999	120,747	363,757	+ 201.3
Serial: Daisy, thimble	20,524	25,761	45,713	64,747	+ 41.6
Serial: Ink jet	*	*	*	30,139	NA
Serial: Thermal transfer	*	*	*	18,903	NA
Serial: Direct transfer	*	*	*	6,142	NA
Line: Thermal transfer	*	*	*	199	NA
Line: Dot matrix	*	*	*	26,187	NA
Line: Fully formed	*	*	*	11,524	NA
Page printers (laser, LED, LCS)	*	*	*	116,590	NA
Teleprinters	19,403	14,830	21,586	6,028	− 72.1
Plotters: A4, B4 size	*	*	*	7,903	NA
Plotters: Oversize	1,205	3,093	2,319	1,421	− 38.7
GROUP TOTAL	**110,126**	**126,683**	**190,365**	**653,540**	**NA**
DISK DRIVES					
3½-inch floppy diskette drives	—	—	34,614	70,827	+ 104.6
5¼-inch floppy diskette drives	—	—	92,388	398,560	+ 331.4
8-inch floppy diskette drives	*	*	*	27,424	NA
5¼-inch Winchester drives	*	*	*	86,713	NA
8-inch Winchester drives	8,423	6,843	15,584	14,838	− 4.8
14-inch Winchester drives	3,690	4,671	4,594	4,701	+ 2.3
Disk emulators	*	*	*	1,615	NA
Fixed disk drives	3,675	4,466	18,349	37,903	+ 106.6
Removable disk drives	8,958	7,610	19,234	31,226	+ 62.3
GROUP TOTAL	**83,549**	**94,588**	**184,763**	**673,807**	**NA**
TAPE DRIVES					
Cassette/cartridge drives	6,708	8,106	10,454	47,484	+ 354.2
Reel-to-reel drives	4,296	6,463	6,256	65,460	+ 946.4
GROUP TOTAL	**11,004**	**14,569**	**16,710**	**112,944**	**+ 575.9**
CRT TERMINALS/MONITORS					
Alphanumeric, monochrome	*	*	*	242,394	NA
Alphanumeric, color	*	*	*	37,231	NA
Graphic, monochrome	*	*	*	72,881	NA
Graphic, color	*	*	*	36,849	NA
GROUP TOTAL	—	—	—	**389,355**	**NA**
MODEMS					
Limited distance	*	*	*	67,969	NA
Voiceband	*	*	*	52,416	NA
Wideband	*	*	*	15,962	NA
Acoustic couplers	*	*	*	7,708	NA
Fiberoptic	*	*	*	2,049	NA
GROUP TOTAL	—	—	—	**146,104**	**NA**
CONVERTERS					
Protocol	*	*	*	4,718	NA
Interface	*	*	*	11,763	NA
Code/speed/mode	*	*	*	364	NA
Terminal emulators	*	*	*	22,170	NA
GROUP TOTAL	—	—	—	**39,015**	**NA**
OTHER					
Memory expansion boards	14,643	7,558	31,276	172,763	+ 452.4
Multiplexors	*	*	*	109,386	NA
GROUP TOTAL	**14,643**	**7,558**	**31,276**	**282,149**	**NA**

*Not included in previous years
NA: not available

Unix's still-tarnished image in the marketplace may remain less than sterling.

computers supporting between one and 10 users and selling for $5,000 to $25,000 are at the bottom.

Just 3.4% of the oems and vars sold big corporate resource computers, while 59.1% of these companies marketed their solutions to single users and work groups of two to 10.

Vars and oems selling 11- to 20-user departmental computers for between $25,000 and $75,000 comprise 19.8% of the sample. Next up the pyramid are the 11.3% of those surveyed who sold large department computers aimed at between 21 and 64 users and priced between $75,000 and $250,000, followed, on top, by the 6.4% who sold business unit computers for groups of 65 to 128 users and at a cost of $250,000 to $1 million.

Again, the emphasis in the systems house/computer oem market is on small systems for small groups of people. The survey data also suggest that this is an industry of small businesses that sell to small business.

In other firsts, the directory's oems and vars were asked to specify the I/O bus standards and operating systems that their products support. At least seven firms are contenders in the race for most used I/O bus standard.

S-100 BUS STANDARD IN LEAD

The S-100 bus standard currently holds the lead with the commitment of 16.6% of the responding companies, followed closely by the STD standard at 14.5%, Multibus-I at 13.3%, and Q-bus at 12.4%. The VME standard has the support of 6.4% of those surveyed, while Versabus is at the bottom of the heap with 1.6%. Another 28.5% of the oems and vars adhere to "other" standards not listed by name in the survey questionnaire.

Together, MS/DOS and PC/DOS, the Microsoft Corp. operating system for microcomputers and its IBM PC incarnation, are sold and supported by nearly half (48.1%) of the 4,256 companies covered in the survey. CP/M continues to have a presence in the oem/systems house market with a 12.4% share of these firms.

AT&T's Unix operating system, meanwhile, is used in some form by 21.8% of the responding vars and oems. Its still-tarnished image in the marketplace may remain less than sterling, however, so long as its total market share is divided among Unix bsd 4.2 (3.3%), Unix Systems III and V (9.0%), and Microsoft's Xenix (9.5%).

For the first time, Technical Publishing tried to assess software purchases by the oems and systems houses in its database. As expected, the data show this field to be hotly contested. The industry leaders—Microsoft, Lotus Development Corp., and Ashton-Tate—are on top in that order with less than 5% of the market each. Here, IBM holds a 2.9% oem market share, behind Softsel (3.6%), MicroPro (3.2%), and MBSI/Realworld (3.0%).

The oems and vars surveyed sold nearly 2.3 million peripheral devices in 1985 (see Fig. 5). Once again, however, comparisons with 1984 data must be made carefully, considering the expanded survey sample.

In addition, comparisons to past years are often not possible at all. As with end-user applications, many new peripheral categories are tracked that were not in-

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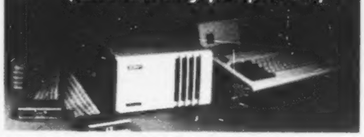

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CIRCLE 74 ON READER CARD

The oems and vars surveyed sold nearly 2.3 million peripheral devices in 1985.

cluded before, like modems and converters.

Out of 2,296,914 peripheral devices sold in 1985, disk drives top the list at 673,807 units, followed by printing devices at 653,540 units. The data suggest that the products to watch in these categories are 3½-inch floppy diskette drives and page printers, whether laser, LED, or LCS.

Oems and vars report they sold 70,827 of the 3½-inch drives and 116,590 of the page printers last year, perhaps reflecting the personal computer industry's move to the smaller drive and the promise—if not yet the reality—of desktop publishing. Meanwhile, the market for plotters, dominated by Hewlett-Packard, is plunging, a fact unmitigated by the survey's doubled sample size.

Shugart lost more than half of its 1984 29.6% share of the 3½-inch floppy drive market to several new players, including Canon, Fujitsu, Sony, and 3M. Apple now leads the field with a 14.9% share, although it fell five percentage points between 1984 and 1985. Texas Instruments commands the page printer market with an 86.5% share. The company's nearest competitor in this field is Hewlett-Packard with a 4% share.

The industry workhorses in the printer and disk drive categories—the serial dot matrix printer and the 5¼-inch floppy diskette drive—continue to dominate their fields, posting 1985 oem/var sales of 363,757 units and 398,560 units, respectively.

Okidata is king in dot matrix printers with a 45% share of the market. The company leads several other printer categories in the survey, too, including serial thermal transfer printers, where it has 79.4% of the market, and line thermal transfer printers, where it boasts a 38.2% share.

Olivetti has a firm hold in 5¼-inch diskette drives, meantime, with a 25.1% market share. Otherwise, both the dot matrix printer and 5¼-inch diskette drive markets are quite fragmented among several contenders, with a number of firms posting an oem market share for the first time in 1985.

Monochrome devices still comprise the bulk of oem/var crt terminal and monitor sales. The combined total of quantities sold in 1985 for alphanumeric color and graphic color terminals and monitors—74,080 units—doesn't even begin to approach the 242,394 alphanumeric monochrome displays sold.

The big player in this sizable market is Wyse with a 35.7% share. Wyse's nearest competitor in alphanumeric monochrome devices is IBM with 10.7% of the market. The market for color alphanumeric terminals and monitors is led by Thomson with 18.8%, followed by DEC with 10.1%. Thomson dominates the graphic color terminal and monitor market too with a 13.6% share.

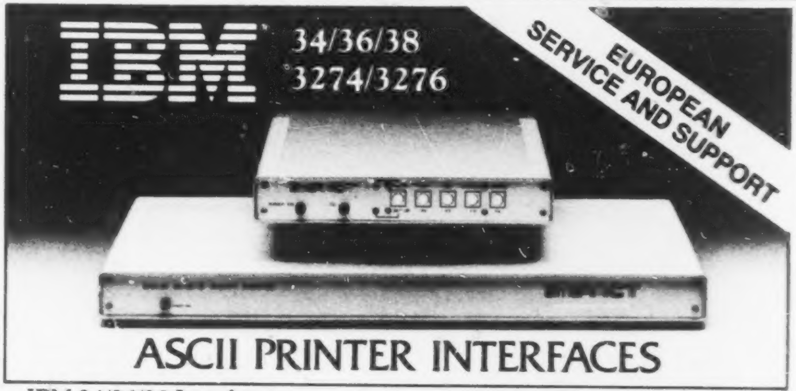
The modem and converter categories are driven by their standard product offerings, as well. Limited distance and voiceband modems (totaling 120,385 units last year) and terminal emulators (at 22,170 units) lead oem/var peripheral sales in these areas.

Not surprisingly, Hayes is the name to know in modems with a 20.9% share of the limited distance market segment and a 16.4% share of the voiceband segment. Hard on Hayes's heels in voiceband modems, however, are Anchor Automation with 14.8% of the oem market and Racal-Vadic with 14.7%. DCA comes out on top in terminal emulators with a 27.5% market share, as it does in protocol converters with 24.1% of the field.

As in the past, memory expansion boards continue to sell briskly. Some 172,763 units were peddled by resellers in 1985. In this area, AST Research continues to be the primary oem vendor with an 18.7% market share. Its closest competitor is Quadram with 7.1% of the oem market.

Like so much of the industry, oems and vars clearly felt the continued slump in the market for computers during 1985. While the number of companies polled went up, the total value of the systems they sold went down. IBM's performance in micros and minis and the continued strong showing of leading oem vendors in other product segments, however, indicates that the reseller market is stable. From such a base, oems and vars stand a better chance of benefiting from the upturn when it comes. ◉

The three-volume *1986 Directory of Systems Houses and Computer Oems* lists 4,256 companies in alphabetical order, by location and oem/var category, by applications offered, as well as by cpu vendors and types of peripherals sold. Priced at $795, it is available from Technical Publishing Co., 199 Wells Ave., Newton Centre, MA 02159, (617) 964-8890.



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TECHNICAL EXCELLENCE FROM DOWNUNDER

CIRCLE 75 ON READER CARD

Departmental computers are destined to become the shippers of corporate information and other resources.

NEW PORTS OF CALL

by George F. Colony

With the mainframe and personal computer marketing games virtually over and won by IBM, the user focus in large companies has shifted to networks of midrange systems. These medium-sized computers will be the bridge between the microcomputer and the mainframe. Ultimately, they will become a means of harmonizing large populations of pcs with corporate information, especially centralized databases.

Some have argued that departmental computing is little more than rehashed distributed data processing—that tarnished icon of the late '70s. Yet the primary force fueling the departmental computing drive is the pc, which was certainly not around in the days of distributed dp. Today, micro users are beginning to demand integration—integration that enables their desktop machines to tap into corporate resources including databases, networks, and server-based software.

Departmental computing will be the best means of delivering that pc integration. In this computing context, departmental systems will act as pc "servants," doling out resources such as software and database information to micros on demand. These systems can thus be thought of as departmental resource processors (DRPs). The DRP is not a traditional timeshared minicomputer. It is an evolved version of the mini, cast in the new role of pc servant.

At a minimum, the DRP is a 32-bit, multitasking engine. Simply stated, it sits in the intermediate space between the microcomputer and the host, acting as a gateway from the department to mainframe. It bridges laterally to other departments on a peer-to-peer basis and also controls department resources such as databases. The DRP balances shared data such as corporate information with personal data like a Lotus 1-2-3 spreadsheet.

Few, if any, terminals attach to the DRP. Micros are connected over a high-speed local area network to the departmental computer. In addition to the evolved minicomputer, the DRP engine could also be a PBX/hybrid à la the Northern Telecom (Mississauga, Ont.) Meridian/DV-1; an advanced file server with communications and database like Westboro, Mass.-based Banyan System Inc.'s Virtual Network System; or a specialized system like Los Gatos, Calif.-based Britton Lee Inc.'s database server.

In its role as pc integrator/slave/adjunct, the departmental resource processor will provide the following functions to micro users:

- Communications control: linking with a diverse set of nodes within the corporation, such as the host computer, and with the outside world through public databases like Dow Jones;
- Distributed databases: the local database running on the DRP will be closely tied to a superset version at the mainframe and to an individual version located on the pcs;
- New generation of office systems: providing decision support, text filing, and group scheduling through polled pc-based calendars;
- Pc software distribution: provided from the mainframe to the DRP and down to each pc, which eliminates costly manual software administration and distribution;
- Support for departmental, vertical applications: as the minicomputer grows into its DRP role, it must continue to run such embedded applications as order entry, general ledger, and word processing.

FOUR BASIC BENEFITS

From a user standpoint, the DRP has four basic benefits. First, it provides access to a wide variety of corporate information. Second, DRP implementation parallels corporate structures that are based around departments. The departmental computer also satisfies a user's psychic need for independence. Finally, DRPs give middle management a more active role in technology management.

Personal computers appeal to U.S.

PHOTOGRAPH BY WALTER WICK

It remains to be seen whether IBM's 9370 will break DEC's lock on the DRP market.

corporate users because the machines stand alone, unencumbered by the scrutiny or formal rules of the MIS department. Presented within this framework, pcs pose a minimal threat to the status quo.

Over the past two years, micro users have demanded to be assimilated into the corporate information structure. The fast growth in the installation of 3270 emulation boards attests to this. New user networking requirements have reached a critical mass as personal computer populations have expanded at the departmental level (see Fig. 1).

The primary raison d'être for departmental computing is its promise of improving company communications. The obvious tool for making that improvement is the microcomputer, which is underutilized in many firms. Users looking for a way to leverage their pc investments are prime candidates for DRP. Integration by means of a DRP would extend micro muscle by giving users a way to share files easily without having to move diskettes around manually, thus eliminating "sneakernet." Users would also have a means of linking with and building departmental databases, giving users access to reports and correspondence that were formerly stuck away in file cabinets or buried in an unwieldy MIS "green bar" report. In addition, departmental processing provides more efficient use of pc software by tightly coupling it with the DRP database.

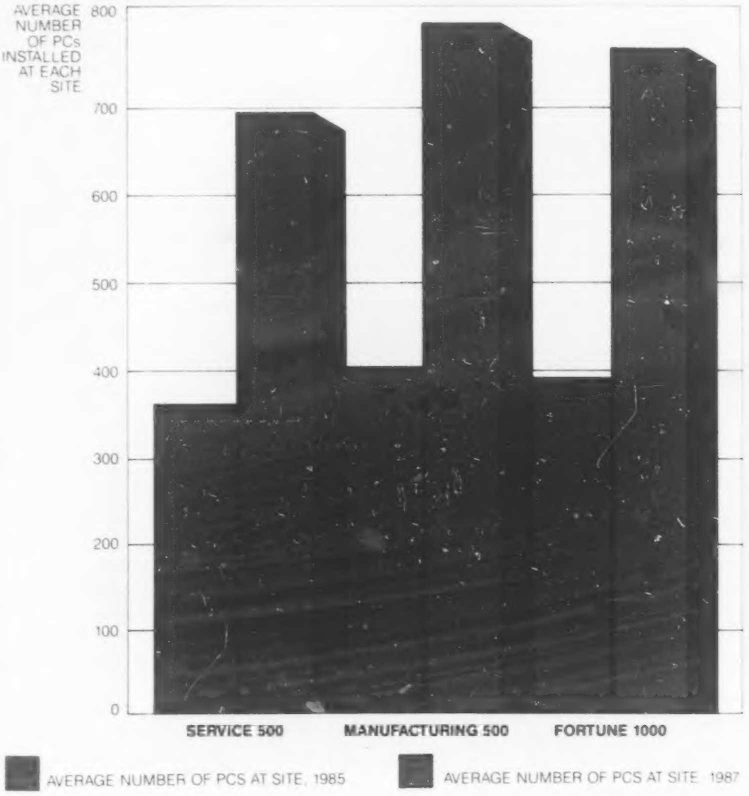
Departmental resource processing closely matches the organizational structure within large companies. This can be determined by examining the type of information pc users in those companies want to access. An informal survey by Forrester Research Inc., Cambridge, Mass., found that 60% of that information is located within the user's department, 25% is somewhere else in the user's site, 10% is at a remote location in the company—most likely in a mainframe—and 5% is in a public database like Dow Jones.

Micro-to-mainframe links assume that pc users are oriented to host-based information. Unfortunately, this approach overlooks the critical mass of information that is contained at the department or work group level. With micro-to-mainframe connections, intradepartmental correspondence must go "around the horn" to the mainframe to reach a nearby desk.

The micro-to-mainframe route also puts end users right back in their predicaments of old—being subject to the whims, rules, and backlogs of centralized, mainframe/batch-oriented MIS management. The DRP, on the other hand, meets users' psychic requirements for autonomy. They can set their own priorities and manage information based on departmental timetables and, even more important, they don't have to fight with the MIS department to get their work done. The DRP gives user departments the independence to own and ultimately control their own data, free of the corporate demands placed on that information.

FIG. 1

AVERAGE NUMBER OF PCS INSTALLED



SOURCE: FORRESTER RESEARCH INC.

PROBLEMS STILL TO BE SOLVED

While distributed resource processing offers much promise for the future, there are still problems—technical as well as nontechnical—that must be resolved before the concept can be successfully implemented. These problems come in the four main areas of security, distributed database, incompatibility, and organizational resistance. On the security side, the distribution of data among many departmental computers will make it far more difficult to track, manage, and protect sensitive information. In the end, securing data that are fragmented on many departmental systems could become the most critical factor blocking full implementation of DRP.

There are other distributed database concerns as well. To make DRP work, databases must be divided into three parts: one small portion at the pc, a departmental version at the DRP, and a corporate superset at the mainframe. This type of fragmented database is not currently available, except in a more general form in the Focus software from Information Builders, New York.

The incompatibility issue is the third trouble spot. PC/DOS, minicomputer operating systems like VMS, and mainframe systems like MVS share no compatibility. These big differences between machines will hamper the cooperative relationship envisioned by distributed resource processing. Attitudes inside the user organization could also stymie the development of DRP. At the end user's end, micro managers may protest because they'll feel that departmental processing will erode their hard-won autonomy from the MIS department. MISers wedded to the IBM way may fight DRP because Big Blue's offerings in this area are weak.

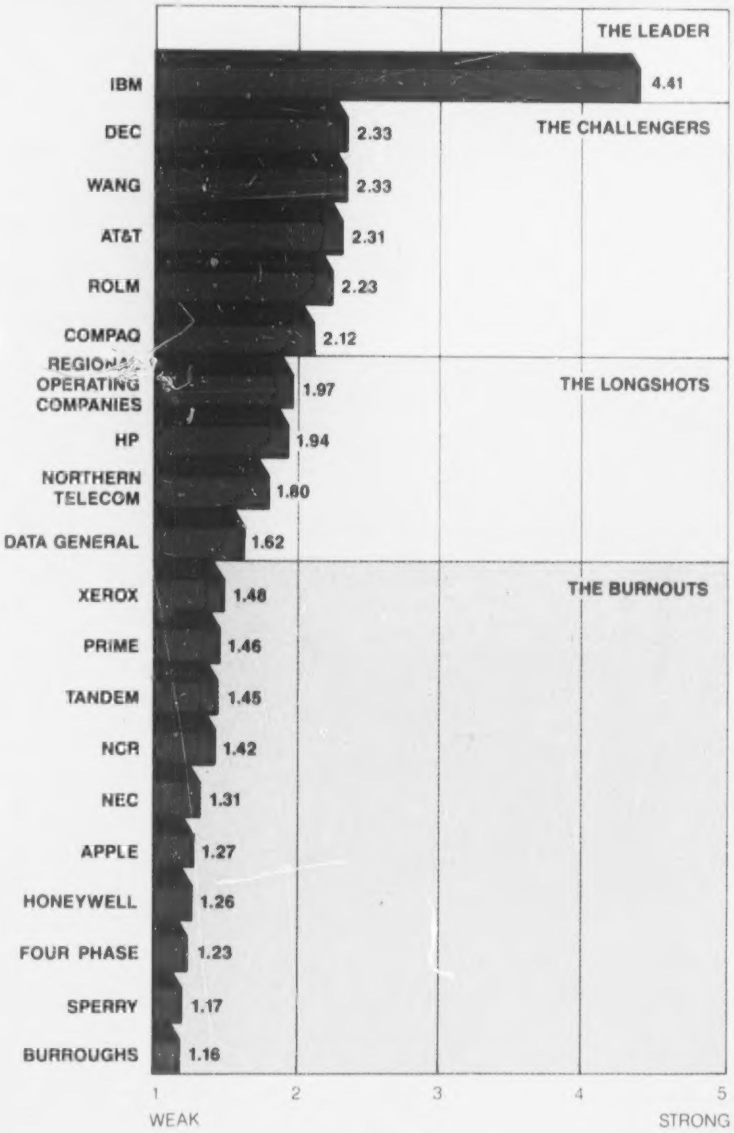
RULES OF GAME WILL CHANGE

There is no doubt that departmental computing will change the rules of the game for IBM and other systems suppliers such as Digital Equipment Corp. and Wang. The old image of the minicomputer as a timeshared facility will have to be discarded in the new era of departmental computing. Terminals will become much less important and vertical solutions/software will have to be reconfigured to fit with distributed database and other DRP-based systems.

To get an idea of current positioning in the DRP market, Forrester conducted a survey of 300 Fortune 1000 companies, asking them to rate 20 vendors as providers of pc integration products. The respondents to the survey were primarily high-level computer, office automation, or communications planners who had such titles as director of data processing, director of MIS, and director of communications. The survey results are shown in Fig. 2.

FIG. 2

USER RATING OF VENDORS AS PC INTEGRATION PROVIDERS



SOURCE: FORRESTER RESEARCH INC.

The vendors in the DRP market can be divided into four groups: the Leader, the Challengers, the Longshots, and the Burnouts. There's no surprise who's leader of the pack. Despite its continuing problems at the midrange level, IBM is still perceived to be the primary vendor to large users. IBM's 4.41 score was much better than its nearest competitors, Wang and Digital Equipment, each of which had a 2.33 rating. The company's continuing support from users will give it time to regroup its midrange efforts for a full frontal assault on Digital. IBM's salient weapon? It's a scaled-down 4300.

Next come the Challengers, headed by DEC. The company's micro integration rating is surprisingly low. Digital's recent moves to improve pc attachment to its VAX line, including offering DOS services under VMS, should make the company a closer competitor to IBM in the short term.

In spite of recent difficulties, Wang has held onto the confidence of its customers. If its problems persist, however, Wang can be expected to quickly fade into the league of Longshots. Ranking very close to both DEC and Wang is AT&T. While AT&T continues to lose an unprecedented amount of money in its attempts to crack the computer business, the company still scores relatively high grades from users.

Rolm rated well because it was able to ride on IBM's coattails. In fact, a number of survey respondents directly equated Rolm with IBM, grading the PBX vendor accordingly. Last but not least comes Houston-based Compaq, the most surprising member of the Challengers. The company's good user rating is an indication of its strength as a pc supplier to the Fortune 1000.

There are four companies in the Longshots list. First come the regional operating companies, which are the wild cards in the DRP market. Then there's Hewlett-Packard, which offers a rich mix of departmental products. Nevertheless, the California company's sales force continues to be oriented toward the scientific/engineering environment.

Northern Telecom also has some marketing problems. The firm's DV-1, which is conceptually targeted at the departmental computing domain, has users confused about whether the system is really a small PBX or a pc integration vehicle.

If IBM does not strike back with a viable midrange offering, DEC will have a lock on the DRP market over the next two years.

Next comes Massachusetts mini maker Data General. On the departmental scene early with its CEO system, DG has not followed through with a complementary pc integration strategy.

The Burnout companies have seen their fortunes with the Fortune 1000 ebb and flow. Xerox, Prime, Tandem, NCR, NEC, Apple, Honeywell, Four Phase, Sperry, and Burroughs have been relegated to filling niches or trying to hold on to their limited installed bases. Forrester sees Xerox, NEC, NCR, and Prime as the only vendors capable of boosting themselves into the ranks of the Challengers.

The Challengers, of course, are all IBM's closest rivals. That closeness is a function of IBM's strength, which will be greatly enhanced if it can get its act together at the midrange level. In that case, the mighty company's domination of the microcomputer and mainframe markets would act as a pincer against other DRP suppliers. It remains to be seen whether IBM's new midrange offering—the 9370, unveiled in October—will be enough to break Digital Equipment's current lock on the DRP market.

AT&T, Data General, Wang, Hewlett-Packard, Prime, and Northern Telecom could also emerge as important players in the departmental computing realm. Other companies such as NEC, NCR, and Sperry must hit a home run if they hope to avoid niche roles in the Fortune 1000 firms.

In those top firms strategies for harmonizing pcs remain elusive. The relative immaturity of IBM's token ring network and the failure of the System/36 as a pc integration vehicle have hampered the harmonization effort. So have minicomputer vendors that have come up with unfocused solutions to the problem. The high cost/low functionality of micro-to-mainframe links has also not helped users in their quest for pc harmonization.

What could help users in that quest is the departmental computer, which will be the key to tying pcs with corporate networks. That bridging function will be just one of the chores performed by the DRP. In fact, the greatest strength of the DRP is its ability to play many roles, evolving over time from a cost-effective local processor into a pc servant/communications hub.

The departmental computer will have a broad impact on how medium-sized and large-sized companies manage technology. In the future, central information resources that are based around the mainframe will be pushed out into departments. As a result, the central site will lose some programmers and operations personnel, who will be moved out to maintain and manage departmental computers. A part of the central database will also be transferred into departmental systems that are closer to users. In addition, some end-user applications development will be distributed.

The host will play a diminished role as peer-to-peer networks proliferate. Mainframes, however, will not go away. The host will continue to run large transaction processing systems, applications that require a high level of security, and some jobs that lend themselves to centralization such as corporate ledgers. Mainframes will also carry the corporate database, acting as the main repository for information distributed in departmental computers.

As resources become more highly distributed in Fortune 1000 companies, a new model of information management will be required. In this new management mode, centralized, vertical information management will flatten-out, becoming more horizontal in structure. The MIS department will have less of a direct role in equipment acquisition. Instead, it will become more of a consultative entity, setting broad strategic goals for the company. Direct control of information systems will be transferred to "mini-MIS" organizations in departments or at sites.

Under this envisioned management model, the MIS department will set standards for a top-down architecture. This architecture will likely include IBM's SNA and DISOSS, database standards, and other broadly defined resources. Meanwhile, the mini-MIS operation, functioning as a grass roots group, will define bottom-up requirements such as pc/DRP applications, local databases, and local area networking.

These bottom-up requirements would interlock with the top-down architecture. Also, in most companies, the top-down architecture will, to a certain extent, channel the general direction of bottom-up requirements. Nevertheless, the MIS battle plan must still be flexible and responsive to end-user needs.

Answering those needs is crucial, because ultimately only end-user departments can understand how computer and communications systems can be used to gain a specific competitive advantage. In this sense, mini-MIS will guide the tactical use of technology inside the corporation. The MIS department will then become the corporate technologists, ensuring that the strategic technology plan squares with the corporate strategy. They may also manage what's left of that vestige of the '70s—the mainframe. ◉

An analyst in office systems and communications, George F. Colony is president of Forrester Research Inc. in Cambridge, Mass.

"None for Richard. Alcohol activates his reptilian brain."

CARTOON BY NICK DOWNS

A new survey says the end-user revolution is over; the action has moved to other battlefields.

MIS RATES THE ISSUES

by Martin Herbert and Curt Hartog

What are the key issues facing MIS managers? What are the major effects of the rapid increase in end-user computing? To find out, the Center for the Study of Data Processing (CSDP) of Washington University, St. Louis, in conjunction with DATAMATION conducted a survey of Fortune 1000 companies throughout the U.S.

The results of the survey are quite diverse, but two conclusions stand out. The end-user "revolution," as seen by MIS managers, is over, and a counterrevolution aimed at winning the hearts and minds of top management has begun. The three top-rated issues—alignment of MIS with business goals, data utilization, and education of senior personnel—portray a major repositioning of MIS management attitudes. Gaining control of end-user computing now appears less important than demonstrating to top management the value of a responsive MIS in accomplishing business goals.

These are the key findings from a two-part questionnaire sent to 1,500 managers identified as "key man on-site" in their companies. Six hundred questionnaires were returned—a solid response rate of 40%. Within the survey population, manufacturers were most heavily represented (42%, about one third of whom were computer manufacturers). Finance, trade, utilities, and government were each represented on from 8% to 12% of the questionnaires returned.

Although the companies were large—half of them had billion-dollar sales or revenues—50% of all respondents (and 40% from the billion-dollar companies) worked at sites with no more than 20 dp employees. About half reported that their companies had chief information officers (CIOs) or their equivalents.

The overall rankings from the 23 questions comprising the first part of the questionnaire are represented in Fig. 1.

The significance of alignment's number one position cannot be overstated. At a time when competitive pressures are squeezing many organizations and forcing cuts of personnel and unproductive business units, MIS managers are shifting their horizons from technical management and planning to the business objectives defined by top corporate leadership.

Somewhat surprisingly, the second-highest rating went to data utilization. On first glance, the importance of this rather narrow and technical issue is not apparent. Yet, in conjunction with the high ranking of alignment, the overall sense is clear. Alignment means assuring that data are made available to the right person in a timely manner, the crux of data utilization. From another angle, data utilization is both the goal of alignment and the means to increase it.

The third-ranked issue, educating senior personnel, follows the same pattern. Its intrinsic value is not obvious, but, given the number one and two rankings of alignment and data utilization, the importance of communicating MIS's role and its potential contribution to senior management makes sense.

Increasingly, MIS management seeks to coordinate key decisions about information technology with corporate strategic and tactical objectives. For example, in converting from DOS to MVS, many MIS managers may focus on discovering corporate strategic plans in order to inform management better about the business consequences of the conversion.

STRATEGIC VIEW OF MIS

Taken together, the three highest-ranked issues comprise a strategic view of an MIS function more oriented toward business objectives. MIS managers, traditionally viewed as good technical leaders, indirectly portrayed themselves in the survey as being (or wishing to be) part of the top corporate management team. Hence, the top issues reflect an emphasis on MIS effectiveness instead of efficiency.

Despite this strategic sense of their mission, respondents predictably ranked software development and productivity very high (fourth and fifth, respectively). Software development is MIS's traditional bread and butter role, the activity that, for better or worse, characterizes dp to the rest of the corporation. Productivity focuses mainly on how well MIS performs that software development role.

In fact, the emphasis on software development productivity overlaps one aspect of the current strategic emphasis: responding quickly to changing business needs. The combination of intense competitive pressures and the availability of information technology in user departments makes business managers less inclined to queue up for new, MIS-developed systems—to become part of the backlog. In turn, politically savvy MIS managers are seeking major improvements in productivity.

In any case, the five highest-rated issues reveal two patterns: a strategic focus on top management and a traditional emphasis on building information systems. Planning, ranked sixth, lends itself to both.

Three of the four issues that round out the top 10 suggest another grouping: integration of technologies, telecommunications technology, and office automation. Together, these illustrate the growing role of information technologies outside of the traditional MIS shop and the backbone role of telecommunications in distributing the benefits of automation.

A major surprise is the absence of end-user computing (ranked 12th) from the top group. Comments made in the second part of the questionnaire do not suggest that all the problems are solved, but that opinion about the impact of end-user computing is divided.

The lower-ranked issues fit into four categories: narrowly focused items, such as CIM, centralization, and measuring productivity; leading edge technical topics, such as expert systems and artificial intelligence, and fourth generation languages; issues that are apparently losing importance as they lose their newness, such as information centers and telecommunications deregulation; and leading edge alignment topics, such as decision support systems, strategic systems, and external data.

It is wise to remember that in taking a first sweeping glance at the results, the rankings do not measure the absolute importance of any given issue. Importance varies according to industry categories, size of company, and many other variables. In a deeper sense, the ranking of the issues is an

A major surprise is the absence of end-user computing from the top group of issues.

indication of the managerial bias of the survey population. The lower ranking of newer or more narrowly focused items reflects accurately the character and concerns of managers as opposed to technical practitioners. Given the strong orientation toward aligning MIS with corporate goals revealed in the survey's top-rated issues, the lower ranking of many items is even more understandable.

The strong response rate lends weight to the survey findings and encourages comparisons with prior surveys. In particular, comparisons with the 1985 CSDP Opinion Survey and another published by the *MIS Quarterly* (September 1984) elicit some significant trends.[1]

Because the actual sampling for the 1984 survey was done over a six-month period in 1982-83, the trends uncovered by comparison with current findings cover almost four years. Fig. 2 compares rankings from the three surveys.

These can be examined in several ways. Easily overlooked are the eight issues that have remained relatively stable across the three studies. Using the 1986 rankings, that group is shown in Fig. 3.

FIG. 1

AVERAGE RANKINGS

Respondents rated issues as not important, somewhat important, fairly important, or extremely important. The overall rankings are derived from the average rating across all respondents, with not important scored as 1, and extremely important as 4.

RANK	ISSUE	AVERAGE RATING
1.	**Aligning MIS with Business Goals**	3.54
2.	**Data Utilization**	3.49
3.	**Educating Senior Personnel**	3.33
4.	**Software Development**	3.31
5.	**Productivity**	3.26
6.	**Planning**	3.25
7.	**Integration of Technologies**	3.21
8.	**Telecommunications Technology**	3.17
9.	**Quality Assurance**	3.16
10.	**Office Automation**	3.09
11.	**Data Security**	3.06
12.	**End-user Computing**	3.00
13.	**Recruiting and Training**	2.91
14.	**Information Centers**	2.82
15.	**External Data**	2.82
16.	**Decision Support Systems**	2.81
17.	**Centralization**	2.70
18.	**Telecommunications Deregulation**	2.63
19.	**Measuring Productivity**	2.59
20.	**Fourth Generation Languages**	2.57
21.	**Strategic Systems**	2.42
22.	**CIM**	2.25
23.	**Expert Systems and Artificial Intelligence**	2.21

THREE CLUSTERS OF ISSUES

The issues group themselves neatly into three clusters near the top, middle, and bottom of the rankings. The top cluster, of course, reflects MIS's traditional mission, as discussed earlier. The middle group, significantly lower, represents MIS's initiatives toward end-user computing. The bottom group contains largely new or narrowly focused technologies that have not yet reached the mainstream. It should be noticed that Expert Systems and Artificial Intelligence had a much higher average rating in 1986 than in 1985, when it was far below all other issues.

Issues that have increased or decreased are described in Fig. 4.

Some items stand out dramatically, such as end-user computing, which has dropped precipitously. Even more interesting is the reversal in the positions of planning and alignment since the 1984 survey. Because they are so closely related, the exchange suggests that alignment has replaced planning as the key issue for MIS management. In the earliest study that mentioned the alignment issue ("support of the objectives and priorities of the parent organization"), it ranked sixth.[2]

Planning, of course, has always aimed at coordinating MIS objectives with corporate goals, but the popularization of a more strategic and "competitive" view of MIS has recently gained currency through the work of Warren McFarlan, Michael Porter, and enterprise studies like the annual CSDP-IBM conferences on Enterprise-Wide Information Management.[3] At the same time, the notion of making MIS more integral to senior management through a cio has gained wider acceptance. Half of the 600 survey respondents indicated that their organization had a cio. Hence, the hypothesis is that generic MIS planning has been displaced—or replaced—by the much more specific notion of alignment.

Looking at the other issues that have increased or decreased in importance, it is likely that the shift to an alignment perspective has had a clear "pulling" effect. Items like data utilization and education of senior personnel are pulled up sharply, one reflecting a technical and the other an organizational consequence of an alignment strategy. Telecommunications technology—again, an issue with strategic ramifications beyond its technical parameters—also can be seen as pulled up by alignment. In fact, decision support systems, which may have been pulled up by the alignment strategy, registered the largest gain in average rating from 1985 to 1986.

Turning from the alignment hypothesis to issues that dropped in importance, end-user computing and data security stand out above the rest. Why they have dropped is not obvious. To a great degree, end-user computing may appear a less monolithic issue, and addressing its component parts separately may decrease its overall importance. Managers may also feel more control over some of the components, which could explain the drop of data security. Finally, the two issues may simply be falling into line with the perceived importance of related issues, such as information centers and office automation, clustered in the middle of the rankings.

Other changes seem more obvious.

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[1] Curt Hartog and Martin Herbert, *1985 CSDP Opinion Survey* (St. Louis: Washington University, 1985); Gary W. Dickson, Robert L. Leitheiser, James C. Wetherbe, and Mal Nechis, "Key Information Systems Issues for the 1980's," *MIS Quarterly*, 8 (September 1984), pp. 135-59.

[2] E.W. Martin, "Critical Success Factors of Chief MIS/Dp Executives," *MIS Quarterly*, 6 (June 1982), pp. 1-9.

[3] W.F. McFarlan, J.L. McKenney, and P. Pyburn, "The Information Archipelago: Plotting a Course," *HBR*, Jan.-Feb. 1983, pp. 145-56; M.E. Porter, *Competitive Advantage: Creating and Sustaining Superior Performance* (New York: Free Press, 1985); R. J. Benson and M.N. Parker, "Enterprise-wide Information Management: An Introduction to the Concepts" (IBM L.A. Scientific Center, May 1985).

The drop in recruitment and training could be explained by market factors, while the decline in telecommunications deregulation may reflect an issue becoming less important because its effects are better known. In any case, the trends reveal MIS managers as more politically aware and more like business managers than is sometimes assumed.

End-user computing. The second section of the survey, which examines end-user computing's impact on the MIS function, partially supports the alignment hypothesis. For example, in describing how the MIS function has changed as users have undertaken more application development, 63% said MIS had assumed a more advisory role and 40% said that MIS was more strategically postured. (Many of the questions allowed multiple answers, so the percentages do not add up to 100%.)

FIG. 2

ISSUES RANKED BY YEAR OF STUDY

ISSUE	1984 RANK	1985 RANK	1986 RANK
Planning	1	1	6
End-User Computing	2	4	12
Integration of Technology	3	7	7
Software Development	4	3	4
Productivity	5	NA	5
Alignment	7	2	1
Recruiting and Training	8	15	13
Data Utilization	9	4	2
Decision Support Systems	10	19	16
Office Automation	12	11	10
Telecommunication Technology	13	10	8
Data Security	14	6	11
AI and Expert Systems	18	21	23
Educating Senior Personnel	—*	8	3
Quality Assurance	—	9	9
Information Centers	—	12	14
Telecommunications Deregulation	—	13	18
Measuring Productivity	—	14	19
Fourth Generation Languages	—	16	20
Centralization	—	17	17
External Data	—	18	15
CIM	—	20	22
Strategic Systems	—	—	21

*Issue not included in prior surveys. NA: not asked

IMPORTANT PATTERN RESULTS

Pursuing the alignment hypothesis obscures equally important patterns in the results. One very striking view emerges when the questions are grouped into four categories: Training, Data, MIS Roles, and Effects of End-user Computing.

In each of the four, the results can be examined by company revenues, size of dp shop, type of industry, and presence of a cio function. Results for certain questions were also classified according to responses on other questions.

Training. The results portray a diversity of approaches to the training of users. Responses to a question about how training should be delivered were almost equally divided among the following: in anticipation of user demand, as users request courses, and in assisting users to develop their own courses. Similarly, responses to inquiries concerning the ways MIS uses its staff for training also divide equally between "assign full-time staff" and "create liaisons to user management."

There were also significant variations among respondent types. Those who thought MIS had less power and that planning had become harder because of increased user participation were more likely to choose reactive approaches to training. That is, they were more likely to develop training and consulting on an "as needed" basis.

Another question asked for the objectives of the information center. Each of the six objectives listed was chosen by at least a quarter of the respondents, with "consulting help on specific problems" and "training in hardware and software packages" chosen by more than half.

Interestingly, a question that asked for the areas in which MIS should educate users drew high numbers (60% to 70%) for such traditional MIS areas as "requirements definition" and "backup and recovery techniques." This suggests two interpretations: either MIS managers are willing to let users develop their own applications, or MIS managers have been forced to relinquish applications to users yet still feel accountable for the results.

These high numbers also suggest that MIS managers are willing to let go of users who have been entrusted with the crucial role of developing applications.

Data. The results in this category contain few surprises. MIS tends to set standards either for all corporate or for some departmental systems. Access to corporate data is in turn governed more by MIS or corporate policies than by technical restraints. Smaller business units (revenues less than $25 million) and smaller shops (fewer than 20 dp employees) were more likely than others to choose departmental standard setting and technical constraints to data access.

MIS frequently, but not universally, had the overall responsibility for assuring the quality of corporate data. Each of the aspects listed (security, timeliness, integrity, etc.) was chosen by 60% to 77% of the respondents. These numbers were lower for smaller shops and business units.

MIS roles. Questions grouped under MIS roles indicate the ferment now occurring in the field. Predictably, the MIS director was most frequently chosen as the job category most responsible for managing technology changes in the organization, but only 38% chose that response. Ten percent chose no one, and respondents who made this choice were more likely to think that MIS had less power and that planning was harder. They were also more likely to work in companies that had no cio. Respondents in the Trade and Finance categories were less likely to say no one; those in the Utility category were more likely to choose that response.

FIG. 3

STABLE ISSUES

ISSUE	1986 RANKING
Software Development	4
Productivity	5
Quality Assurance	9
Office Automation	10
Information Centers	14
Centralization	17
CIM	21
Expert Systems and AI	23

A question about future MIS roles as users assume more responsibility for technology found the highest number (74%) viewing MIS in a consulting role to departmental systems. The percentage is even higher in the Trade category. The percentages across all the other response categories are relatively modest, yet the categories describe MIS's traditional, central roles. For example, only 58% said that developing

MIS managers are more politically aware and more like business managers than is sometimes assumed.

FIG. 4

ISSUES THAT CHANGED RANKS

ISSUE	1984 RANK	1985 RANK	1986 RANK
UP			
Alignment	7	2	1
Data Utilization	9	4	2
Educating Senior Personnel	—	8	3
Telecommunication Technology	13	10	8
External Data	—	18	15
DOWN			
Planning	1	1	6
End-User Computing	2	4	12
Integration of Technology	3	7	7
Recruiting and Training	8	15	13
Telecommunication Deregulation	—	13	18
Fourth Generation Languages	—	16	20

core business systems would be a major MIS role, and only 49% said that operating core business systems would be. Five years ago, these rates would probably have been much closer to 100%. When the focus moves to smaller shops, the percentages drop into the 30s.

SEE MIS FUNCTIONS CHANGING

Clearly, MIS managers view their departments' roles and functions as changing in fundamental ways as a result of users acquiring information technology. When asked how their departments' roles and functions have changed as a result of users acquiring information technology, 40% said their departments were more strategically postured, while 33% said they were more operationally oriented. This contrast suggests that the impact of users has been felt in widely differing ways. Other new roles were emphasized; among them, MIS's telecommunications responsibility was seen as increasing sharply as a result of micro-to-mainframe links and LAN products.

Effects of end-user computing. The most interesting results appear in this category. Responses to a question identifying the MIS roles most affected by the transfer of information technology to users did not point dramatically to the MIS director (19%) or department head (15%), though they were chosen most frequently.

The most dramatic division of results occurred in response to an item asking how the power of the central MIS department has been affected by users undertaking more applications development. About half (46%) said the department was not affected. The remaining half divided almost equally: 24% said less powerful, while 27% said more powerful. Smaller business units within this half gave more of the latter response and fewer of the former, possibly because MIS professionals are closer to users in smaller organizations. By industry category, Utilities were more likely to choose less powerful; Trade, Finance, and Government were more likely to choose more powerful.

The same sharp division of opinion emerged in an open-ended question that asked how the climate of MIS planning changed as a result of increased user participation. About 25% of the responses were classified as better or more cooperative, and another 25% as harder. Another 15% indicated that the climate was unchanged, and together these three categories comprise about two thirds of all responses. Only 7% said that the planning climate had a more strategic flavor.

Comments help to bring out the range and intensity of the responses. One respondent wrote, "Users have participated for the past three to four years. Each year the process has become more integrated and better tuned as awareness increases. We start earlier, we gather more information, and top management plays a role in the final approval or deferral of automation objectives. MIS operating and capital budgets come from this process."

Another responded, "Planning is shifting toward user requirements. Instead of telling the user what he or she will be using, we ask users what will make them better decision makers."

In the same vein, "User participation is real world, an eye-opener to the flexibility needed in today's environment. But changes in old ways of thinking are slower than needed."

Some comments are less positive. "We are becoming package installers and data custodians, not report writers"; "Planning eliminated"; "More confused"; and finally, "Greater dysfunctional centralization of decision power. The blind leading the sighted."

USERS NOT COMPETENT

When we asked what the single most difficult problem created by user participation was, user incompetence or intransigence was most frequently mentioned (19%). Complaints about users ran the gamut from ignorance to arrogance to lack of commitment. "Ignorance of the complexities and lack of good tools," wrote one respondent. "Everything they read makes it appear simple"; "Everyone is an expert," another noted. "They know the 'perfect' answer to meet their needs"; "False presumption of expertise and consequent disputes over IS strategy." Only about one third of those who identified user incompetence as the major problem had a cio, vs. 55% of all others.

Resentment of users is hardly news, of course, but considering that the respondents were predominantly managers, it is interesting that no other category drew more than 11% of the answers. About 11% indicated that control of standards was more difficult, and another 9% said that providing education or training was a major problem. Another 10% pointed to added cost or effort, and 10% mentioned data (access, security, integrity).

One question asked how technology transfer has worked in reverse—from users back to MIS. It was the least understood item in the survey: many did not answer, or gave inappropriate answers. The intention of the item was to see if technology transfer has begun to come full circle, from MIS to users and back to MIS.

For some respondents, the item was again an opportunity to blast the enemy: "Users seldom present a coherent requirement. They want 'packaged' software on pcs, but don't want to accept limits and restrictions of the software. MIS is expected to 'plug in a few changes' "; "When a user solution doesn't work or user staff changes, especially when the guru leaves, MIS must be able to step in and take over, frequently on short and hostile notice." For others, it was a chance to reassert eternal verities, such as taming the wild user: "At a given level of frustration the user will give back system responsibility. The user then is more sympathetic and patient with MIS problems"; "The micro originally created a barrier for the end users, but now they are crawling back to MIS for expert help instead of going to salesmen."

Those who understood the item—

Respondents attach much less importance to end-user computing than was true several years ago.

admittedly a subjective judgment—gave interesting answers. "MIS serves as an information clearinghouse," one commented, "and users are field testing programs and equipment." Another tied the item directly into MIS productivity needs: "Technology transfer has broadened the traditional programmer's tool kit. Programmers are now using end-user tools [hardware and software] to increase productivity, speed of development, and the quality of the finished product." Another attributed the benefit to better communication: "I feel that in our business the transfer is just getting started. I also feel that it has helped MIS to see real business needs of the user. There is more communication between user departments and MIS, which helps to solve the *real* problem."

NEW VIEW OF MIS ROLES

Most interesting are the answers pointing to a new view of MIS roles and capabilities: "Technology transfer has caused us to look again at our productivity tools and how we measure productivity"; "Users have discovered ways of using existing systems of technology that we were not aware of"; "Yes, users have forced improvements. Users are more expert in some query and analysis packages, such as SAS"; "The users provide and test the knowledge base of what's new and useful"; "We have several users doing things we are not able to stay abreast of."

Still more on new MIS roles: "Technology transfer has made us more aware of the user's needs, constraints, and interests in the automation process. I believe it has created a closer working relationship between the persons utilizing data processing services and MIS personnel, as compared to the earlier days of automation."

In 1986, MIS managers are seeking to align MIS with corporate strategic plans and objectives. To succeed, they must both educate senior management and manage data utilization as effectively as possible. In addition, they must perform MIS's traditional mission of software development to the satisfaction of users, ideally with increased productivity. In general, the overall ranking of the issues portrays respondents as more politically astute and business oriented than is often thought.

On the whole, the respondents attach much less importance to end-user computing than was true several years ago. The pc may be a star, but most managers are not hitching their dp wagons to it.

The broad picture, then, conveys a decidedly managerial outlook, with MIS managers clearly focused on the main chance. Yet, in looking up to alignment with senior management, managers may overlook the productivity potential of some lower-rated issues, such as fourth generation languages, and the continuing power shifts occurring around end-user computing. The counterrevolution may be under way, but the enemy is still alive and kicking. As noted in one comment, "Users have little or no past to be prisoner of." ◉

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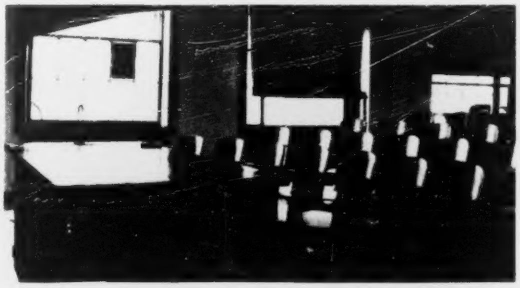

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THE ABCs OF PRINTING

On May 3, 1983, IBM introduced its 2,000 lpm model 4245 line printer. The product suffered from some engineering problems — problems that came as a surprise since IBM's line printers have almost always been the best in the industry. For two years, IBM tried to mollify unhappy users who complained about the device's print quality and stability, but the reputation of the $54,500 box was tarnished beyond repair.

Finally, on May 1, 1985, IBM unveiled a new 4245 that offered the old performance specifications at a new low price of $35,000. A slower version selling for $28,000 was also announced. The new 4245, which came with a one-year warranty, carried maintenance charges of $400 a a month — more favorable terms than its predecessor, which had a three-month warranty and monthly maintenance fees of $650. Even though the sales pitch for the revitalized 4245 touted the unit's improved price/performance, the main advantage of the new machine over the old one was its superior quality. Redesigned and repriced, the 4245 won over users in droves (see p. 59).

TAMING THE DASD MONSTER TAXING TIMES FOR LEASING
DESKTOP PUBLISHING: A NEW CHAPTER

DATAMATION

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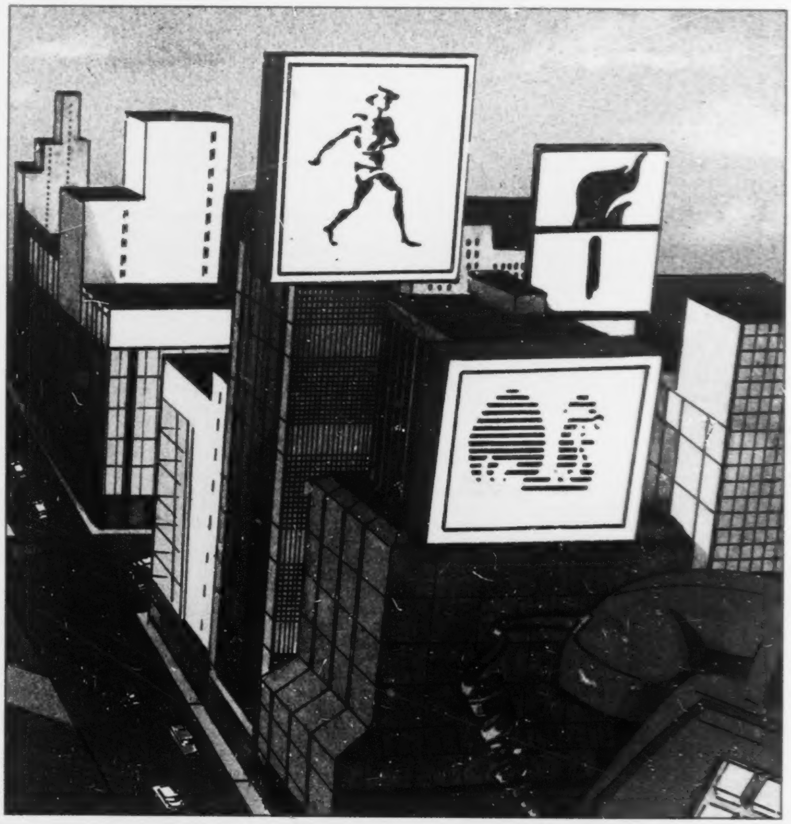

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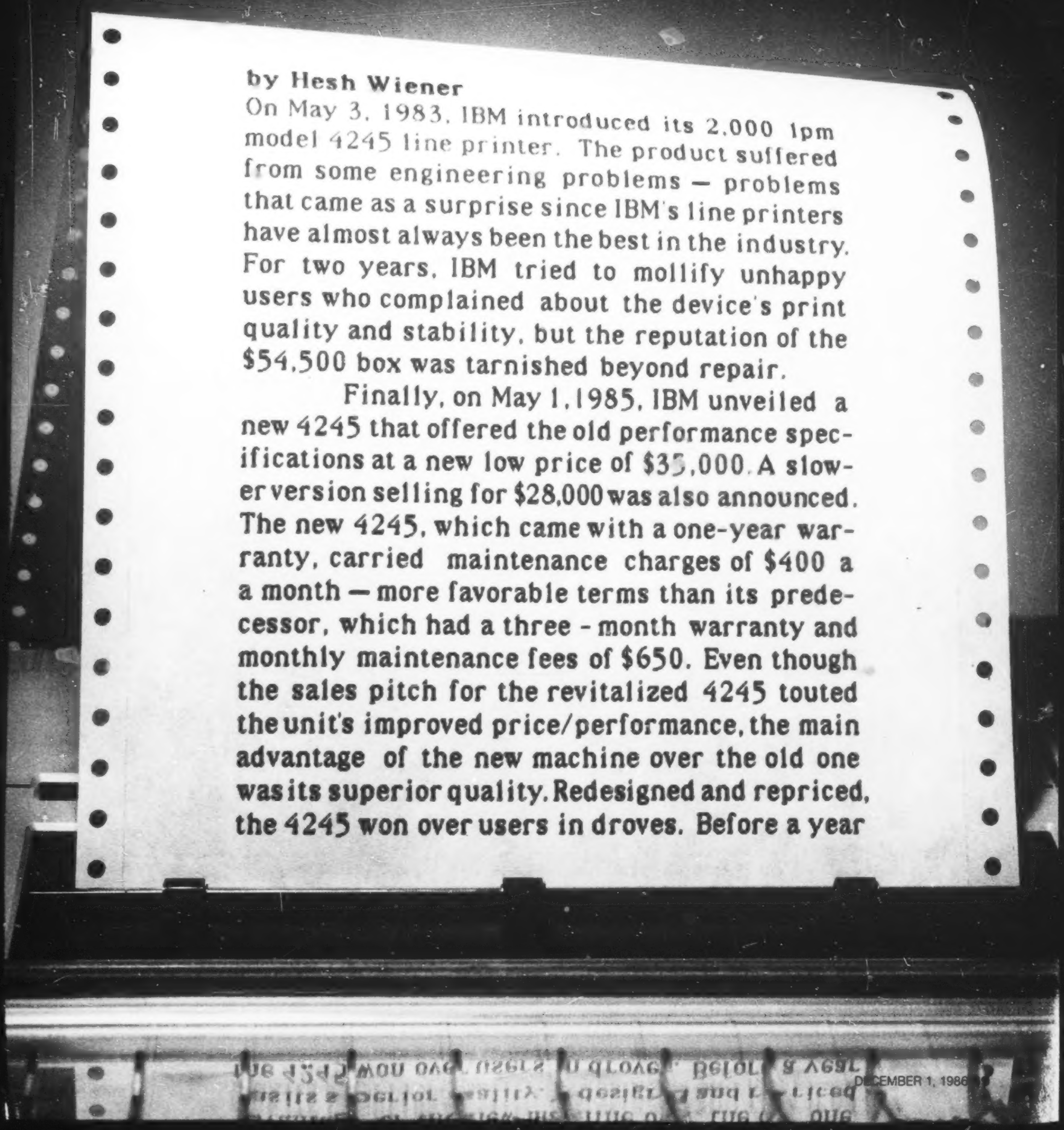
THE ABCS OF PRIN



by Hesh Wiener

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This success, however, did not spell relief for disgruntled owners of the original 4245s. In fact, it exacerbated their woes. Customers who purchased the first version of the printer are married to the machine. The printer simply cannot be resold. Nobody will buy it at any price. Even leasing companies that invested in the machines have philosophically, if not financially, written them off. Investors in lease-based tax shelters are in the same position as lessors, but because they buy into large and diverse pools of equipment, they are unlikely to feel the pinch.

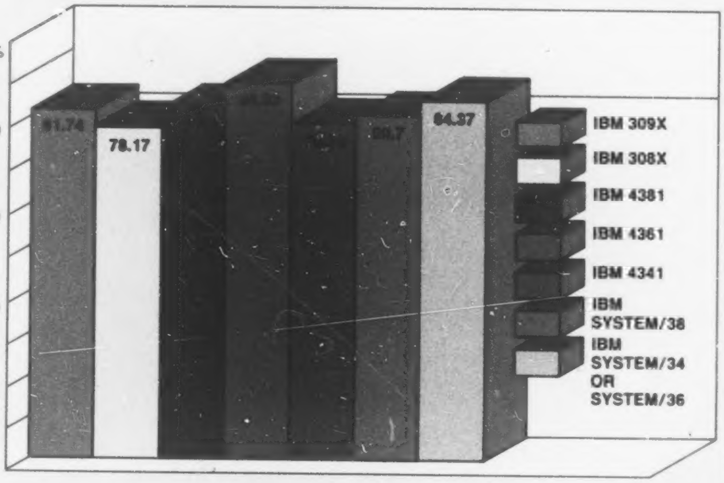
IBM never offered buyers of the older 4245s a chance to trade in their machines for newer and better units. The company's position seems to be that the original machines, even with their faults, performed as promised and, with IBM maintenance, will continue to work for years to come. Indeed, many buyers of the old 4245 appear to be happy.

So are third-party firms that sell used IBM gear as an alternative to the manufacturer's new products. IBM's flub produced a windfall for its third-party competitors. From the time the first 4245 was introduced until the revised version was shipped in volume, the third parties that had portfolios of used IBM printers cleaned up. Such stalwarts as the 1,200 lpm 3203-5 and the 2,000 lpm 3211/3811 printers gained value as buyers bid up the prices. Even the venerable 1403-N1, which dealers had pretty much consigned to the scrap heap, garnered a few orders.

IBM also did well with another new printer, the model 4248 that runs at up to 3,600 lpm. This heavy-duty machine became more attractive to midrange users who might not have been willing to plunk down $99,000 for a line printer under less pressing circumstances. (When the revised 4245 was introduced, the price of the 4248 was cut to $75,000 to maintain sales momentum.) In addition, non-IBM printers from various makers became a bit easier to sell to formerly true blue shops.

FIG. 1

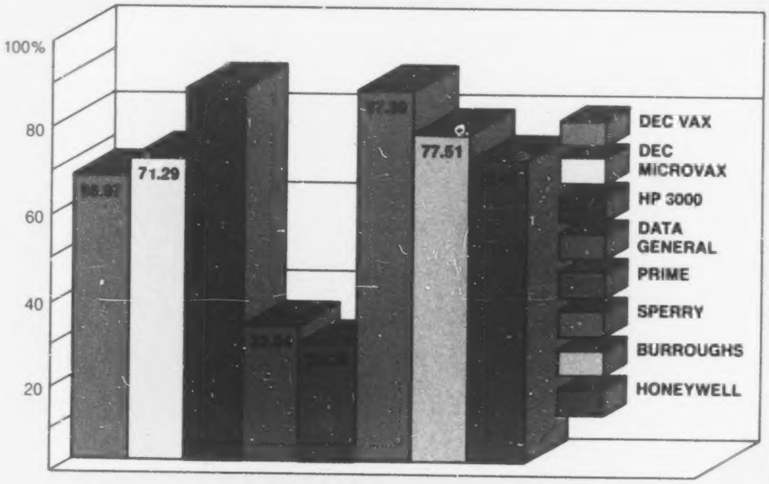
IBM'S SHARE OF PRINTER BASE



SOURCE: COMPUTER INTELLIGENCE SURVEYS OF U.S. INSTALLED BASE

FIG. 2

VENDORS' SHARES OF PRINTER BASES



SOURCE: COMPUTER INTELLIGENCE SURVEYS OF U.S. INSTALLED BASE

A HIGHLY UNUSUAL IBM CASE

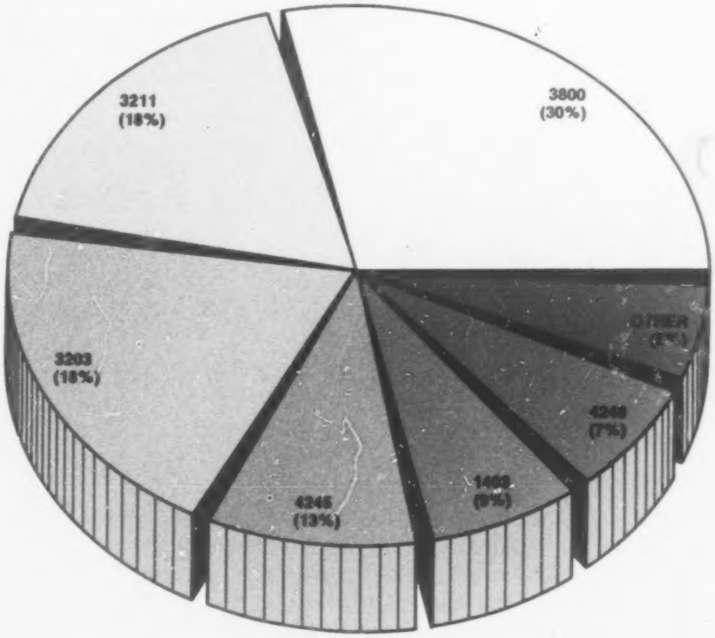
The case of the 4245 was highly unusual for IBM and for the computer industry as a whole. Processor vendors normally enjoy extraordinary success in selling their printers to users, and so, indirectly, do several independent manufacturers that provide printers on an oem basis to the full-line computer vendors. But the story of the original 4245 and what happened when users realized it was not up to snuff demonstrates that even IBM, the strongest vendor of them all, must yield to the will of the market.

The will of the market in the printer sector seems to be operating in favor of the processor vendors. Surveys of the U.S. installed base conducted by Computer Intelligence Corp. of La Jolla, Calif., show that mainframe and minicomputer companies provide the overwhelming majority of the printers installed by their customers. IBM printers are attached to IBM mainframes, Digital Equipment Corp. printers to DEC machines, and so on (see Figs. 1 and 2). The notable exceptions are mini makers Prime Computer and Data General, which have simply not pushed their own printer products the way other computer makers have.

Roughly 10% to 20% of the market veers away from the processor path and goes its own way. That more random route

FIG. 3

IBM PRINTERS ON 3090 SYSTEMS



SOURCE: COMPUTER INTELLIGENCE SURVEYS OF U.S. INSTALLED BASE

represents a substantial opportunity for independent printer makers. It's good for maverick users, too. They don't have to feel they're the only ones out there shopping for their own output devices.

In the personal computer world, things are a little different. Machines built to the IBM standard can drive dozens and dozens of printers. All the successful software packages for the IBM PC family and its vast horde of imitators are designed to drive a variety of output devices. The diversity in this market stems from IBM's decision to go with a standard plug on the back of its original PC, leaving the rest of the interface job up to printer makers and software houses.

Also, IBM did not offer its own printers to PC users at first. Instead, it put its logo on dot matrix machines made by Epson and let users know it. As a result, corporate America grew to trust Epson's printers, and, by inference, those of other Japanese companies. So even though IBM now has two strong contenders of its own in the Proprinter and Proprinter XL, there is little evidence that users can easily be wooed back into the IBM fold in the short run. In the long term, of course, the printer game may go to a persistent IBM.

In the other personal computer ballpark, where Apple goes to bat, the Macintosh requires a printer that can replicate bit-mapped screen images. This has greatly limited most of the company's users to Apple-supplied printers. The Mac, however, does use an independently developed page description language that permits intrepid users to attach various laser printers and typesetters to the machine.

A mainframe's age seems to be a factor in the user's choice of printer. This is evident in Computer Intelligence's extensive studies of the IBM base. While nearly 82% of the printers on 3090s come from IBM, only 78% of the printers on 3080s are supplied by the computer giant. And, while more than 88% of the printers on 4381s are from IBM, only 79% of the printers on 4341s bear Big Blue's logo. The 3090, of course, is the successor to the 3080, just as the 4381 is the follow-on to the 4341. Figs. 3 and 4 show how Big Blue's printer pie is divvied up on the 3090 and the 4381.

Many of the older mainframes are no longer in their original homes. When a user organization decides to install a second-hand computer—and buck the pressure to buy new gear directly from the manufacturer—it apparently is also more open-minded when it comes to buying printers. Used computers almost invariably pass through the hands of dealers. These dealers generally prefer to install all-IBM systems, so the statistics showing that non-IBM printers are more abundant on older machines reflect user preferences, not characteristics of the used equipment market.

STRONG SUPPLIER A FACTOR

Another factor that influenced the preferences of users of old IBM systems was the presence of a strong pcm supplier, Storage Technology Corp. While STC was growing into a billion-dollar business by supplying plug-compatible tape and disk systems, its printer subsidiary, Documation, was achieving substantial penetration into the IBM market. Things have changed dramatically since then, however.

Users, worried over STC's Chapter 11 bankruptcy filing, have been justifiably skittish, though the company's service and support received a great deal of attention from ceo Ryal Poppa. Should a new Storage Technology emerge from court protection with vigor—and the right products—the base of non-IBM printers on new IBM systems will almost certainly increase in size.

Outside the IBM arena, conditions are similar. The other mainframe makers have done roughly as well as IBM, selling most printers to their own user base. Ironically, Honeywell, the only mainframer that's succeeded in selling very high speed, nonimpact printers to IBM mainframe shops, seems to do worse than others in peddling printers of all types to its own customers. But the Honeywell survey data may be influenced by the company's minicomputer base. In the minicomputer business, users tend to be more independent of processor vendors than in the mainframe realm.

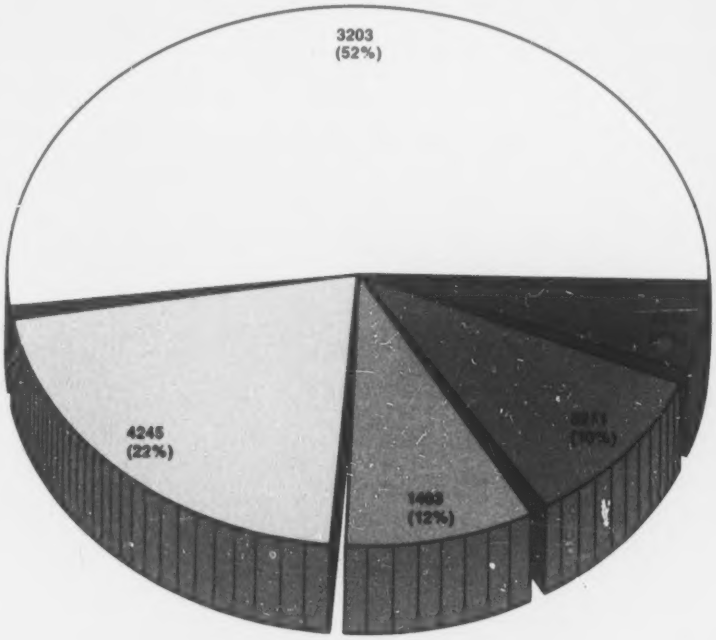
Users of DEC VAX machines are a good example of this independent streak among mini customers. Even though DEC printers enjoy good reputations, VAX users still buy a third of their machines from other suppliers. This can be partly attributed to the important role value-added resellers (vars) play in the DEC VAX market. Vars that provide independently made printers can often give users more value for their money. The vars, meanwhile, increase their profit margins through such sales.

The VAX market is also a much better target for independent printer makers than any other. Digital's VAX base includes more machines than that of the comparably powered IBM 4300 series. That base is also growing more rapidly than the 4300 base. Add to all this the availability of printer interface cards at modest prices, and you get a marketplace that simply boils with competition.

While all this may put the heat on marketing executives charged with selling DEC printers, the peripherals race helps the company sell processors and other system

FIG. 4

IBM LINE PRINTERS ON 4381 SYSTEMS



SOURCE: COMPUTER INTELLIGENCE SURVEYS OF U.S. INSTALLED BASE

components to budget conscious users. These days, that means just about everyone, as DEC's financial results so clearly show. Also, there are indications that the mini manufacturer's increasingly competitive home-brewed printers are winning market share among users who are putting in new VAX machines. The statistics on the MicroVAX base, which includes a larger proportion of recent installations, show that Digital has done a better job of selling printers during the last year or two.

Other minicomputer makers have had mixed success in the printer business. One firm that comes out on the successful side is Hewlett-Packard. The California company, which has put tremendous emphasis on its peripheral wares, has earned strong user loyalty. HP has been providing excellent nonimpact printers for years, and its reputation for good service on all peripherals makes it a force in the field to be reckoned with. The result is apparent in the statistics and in the way the company has succeeded in selling printers to users of rival minicomputers.

It is not only the desktop laser printer market that Hewlett-Packard has taken by storm. The company's midrange laser printers are also in demand. These printers are the basis of the hardcopy output on MCI Mail's VAX network and they show up in many shops that have processors made by HP and its competitors.

Hewlett-Packard isn't the only player in the nonimpact printer business. At the high end, IBM's 3800s are the most widely used machines. Xerox also has a strong entry in the nonimpact niche, as does Honeywell. Kodak too is about to make the plunge into the midrange market, which has become a battleground for makers of high-end machines seeking to expand their business and producers of low-end printers that are looking for growth opportunities. The technologies used by various vendors include laser, LED array, and electrostatic transfer. It looks as if several techniques for inking paper will remain around for some time. So, of course, will paper, a persistent printer problem.

A nonimpact printer suffers from the same trouble copiers do. Paper is a dusty and generally annoying material to move through a complex machine. It also can be stubborn when it comes to taking toner. End users who want a choice in the type of paper they use for billing, management reports, and other kinds of computer-generated hardcopy are unsympathetic to the engineer's dilemma. Every improvement in image quality that an engineer makes is met by a paper mill's development of some new, cheap, attractive, and inhospitable batch of squashed wood pulp.

Nonimpact printers reduce the cost of preprinted forms. As color capability is added to the machines—something likely to happen in the midrange before it does at the high end—even more forms will disappear. Nor has the large dp shop overlooked the way laser printers and their kin have changed desktop computing. By permitting users to control typography, graphics, and other aspects of document production, laser printers have greatly increased the effectiveness of computer printed materials.

Midrange laser printers, which have benefited from progress in page description languages, provide good graphics quality. For users of nonimpact printers, the job of moving images from a workstation screen to paper has been greatly simplified.

What's coming in that era may not be coming from number one. Oddly enough, IBM has thus far been a laggard in the nonimpact printer domain. Most nonimpact printers generate images at 300 dots per inch, but IBM's entries have a significantly lower resolution, 240 dots per inch. While several vendors have been able to link workstations to hosts and printers in a way that permits images to remain intact as they travel down the cables, IBM, with its diverse installed base and incomplete networking strategy, is unable to deliver end-to-end compatibility. While it's true that IBM's problem is far larger than that of other vendors, so is IBM's capacity for coming up with solutions.

During the past couple of years, IBM has outlined much of its document interchange scheme, but so far the company has not committed itself to a page description language that can serve as a way to connect its diverse terminals, systems, and printers. To be sure, IBM has not entirely ignored these issues. Some of its products do support page composition software developed by outsiders and other IBM products can capture, move, and reproduce detailed images. But Big Blue's products still don't all work together in harmony. This same problem afflicts users of other vendors' systems.

USERS AHEAD OF VENDORS

Hundreds of users are already well ahead of the vendors, pushing output systems to their limits. Banks, for example, have greatly improved the ease with which their statements can be read, as have credit card companies. Direct mail solicitations, group travel itineraries, stock analysts' reports, and countless other computer-generated documents attest to the capabilities of nonimpact printers. By contrast, documents with the same content produced on impact printers are starting to look old-fashioned.

Yet image quality is only one appeal of nonimpact printer technology. In high-volume applications, laser printers are the

The power and flexibility of the laser printer necessitate clever software.

most economical and fastest means to generate documents. Large utilities, financial institutions, and government offices have all installed high-end print engines in order to meet production goals. While a fast electromechanical line printer may run at 3,600 lpm, nonimpact printers can spew out upwards of 20,000 lpm in small type.

In terms of document output, several nonimpact printers exceed 100 pages per minute, and the fastest popular unit, IBM's 3800, runs at more than 200 pages per minute. Nevertheless, no laser printer can do the things an impact printer does.

Many jobs require the production of multiple copies, the handling of multipart forms, or the imprinting of self-stick labels. Other jobs are best run on wide paper, card stock, or other materials that accept oil-based inks better than toners. Whether or not laser printers can handle midrange tasks, impact printers are often the least expensive source of hardcopy output.

A mechanical printer capable of running, say, 1,000 lpm and surviving a high-duty cycle may cost $15,000; a nonimpact printer with output of 20 pages per minute can cost twice that much. As speed requirements fall to 300 lpm, prices of heavy-duty impact printers are dropping to the $3,500 range. While desktop laser printers can equal this throughput for a comparable price, they're not made to take the beating a line printer is built to handle.

At the micro level, where dot matrix printers still reign supreme, the laser printer is often a luxury. Nonimpact technology is replacing other means of printing with full-formed characters, but the machines are still too expensive, too large, and too sophisticated for small business applications. Accounting packages and spreadsheets don't demand anything more complicated than a dot matrix printer, and getting these popular software applications to drive a nonimpact printer can be a chore.

The power and flexibility of the laser printer necessitates clever software; such ingenuity is rarely included in business programs. When pretty output is part of the job, the contest between printer technologies is a closer one. Dot matrix printers can draw graphs and charts, but the resulting printout falls short of what can be produced by a laser printer.

On the other hand, the most popular laser printer, Hewlett-Packard's LaserJet, even in its enhanced version, can't do full-page, high-resolution graphics—it will run out of memory before the program driving it runs out of points to draw. The lowly dot matrix printer, which has to remember only one band of dots at a time, can actually produce a more detailed though less crisp printout.

A user who must have graphs as well as character output can also buy an inexpensive plotter, a dot matrix printer, and a PC clone for less than the price of a LaserJet. But for the user who is more concerned with textual output, choosing the right printer for the right job is often a matter of character.

A selection of vendors and the types of printers each makes begins on p. 70. ◉

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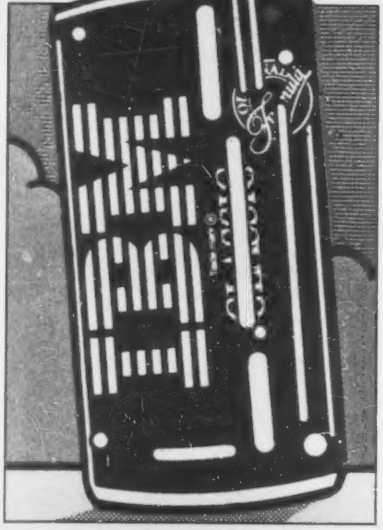

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Editorial

A New Look

This first issue of 1987 begins DATAMATION's fourth publishing decade. As you have noticed by now, we open our 30th anniversary year with a new look. What you may not yet have noticed is that our new look is the architectural structure of a more reader-friendly information package.

Not unlike the challenge you meet when upgrading your own information processing environment, our task was not a simple one. Nearly a year ago, art director Kenneth Surabian was presented with a seemingly insoluble dilemma: to redesign DATAMATION to provide more information for its readers, making the editorial package easier to access, more tightly organized, and more graphically appealing. The caveat: at all costs, retain and showcase those elements that have made DATAMATION the most important and widely read magazine in its field for the past 30 years.

As you read, you will see he has succeeded.

Starting here on the table of contents, you will find a more informative, easier-to-use guide to our pages. We have expanded our Look Ahead column, and have made it international in scope. News In Perspective has been reformatted to allow more stories with more graphic information. The look of our features has also been redesigned, and each now includes a succinct abstract for a swift appraisal of its contents. A new section called Real Time now consolidates our product coverage and departments.

We unveil our new look with our annual IBM issue. As our special coverage points out, IBM this year—unlike any other in its history—is being faced with its first real challenges for leadership in almost all of its traditional markets. From mainframes—where its 3090s have fared worse than expected—to the midrange—where Digital Equipment Corp. is clearly doing Big Blue one better—the erosion is clear. IBM's personal computer leadership, once assured, is now buffeted by waves from the Pacific basin. In communications and software as well, the giant's once sure hand is questioned. Can IBM reclaim its easy dominance of the industry?

For some answers, here is DATAMATION's fourth annual IBM issue, "IBM: The Pressure's On."

George R Davis

GEORGE R. DAVIS
EDITOR-IN-CHIEF

ABSTRACT

IBM's initial success in the micro market far surpassed anyone's expectations, including its own. But when demand for PC products slowed, not only did the company feel heat from increased competition, it also felt the shockwaves from the shakeout in all market segments. Big Blue then made its problem at the low end even bigger when it drifted away from the strategies and standard that had made it the undisputed champion in the micro arena. To recapture that title, IBM must rebuild its micro muscle by providing new state-of-the-art offerings and by beefing up its existing wares with value-added features.

Rebuilding Micro Muscle

BY MICHELE S. PRESTON

Once upon a time IBM was the undisputed ruler of the personal computer kingdom. It captured this coveted crown by adopting the strategies that had made its reigning rivals Apple and Tandy the leaders at the low end. But that was some five years ago, and today that crown has slipped because the company itself slipped up on customer support and on products such as the IBM Portable, PCjr, and the PC Convertible. These slip-ups resulted in substantial market share losses for IBM. To stem those losses and recapture the title, IBM must work at rebuilding its muscle in the micro market.

IBM's initial success in the microcomputer market far surpassed anyone's expectations, including its own. Several factors were instrumental in that success. First of all, IBM pursued an open architecture approach, which encouraged third-party activity on the applications software and peripherals

Illustration by Richard Anderson©

front. Second, the company moved one step ahead of the market by adopting Intel's 8088 16-bit technology for its PC products. And third, it capitalized on the micro momentum already started by Apple at the end-user level. To encourage PC purchasing even more, IBM set up dealer networks for retail distribution. Ironically, it is these very strategies that made the PC effort so successful in the early stages that are at the root of IBM's problems today.

The computer giant's winning PC strategy had a profound impact on the market. By the end of 1983, IBM had captured 25% of the $5.2 billion micro market. In the meantime, IBM-compatible vendors had also gained additional market share. Leaders of the first generation, such as Apple and Tandy, however, suffered serious setbacks as their market shares nosedived.

IBM's big success at the low end enticed other major vendors to enter the market. Taking the pc plunge were Digital Equipment, Data General, Wang Laboratories, Xerox, and AT&T. These companies have had limited success because they never implemented strategies tailored to the unique characteristics of the micro market. Just as IBM missed the boat in the early minicomputer market, the mini makers missed their opportunity in the fledgling micro field.

Meanwhile, venture capitalists, recognizing market opportunities of their own, poured millions of dollars into new PC compatible companies and into software developers, peripherals suppliers, and computer retailers. By the middle of 1983 hundreds of hardware manufacturers were producing compatible products. Some were cheaper than the PC and some offered additional features.

IBM's position remained unaffected by the increased competition from hardware manufacturers hoping to capitalize on the company's open architecture approach and the standard it had created. But when demand slowed, not only did IBM feel the heat from increased competition, but it also felt the shock waves from the shakeout in all market segments. The company further compounded the situation when it began to drift away from the basic strategies that had contributed to its initial success.

One of IBM's major strategies was to incorporate in the PC state-of-the-art 16-bit technology—technology that attracted both developers and users. After the introduction of the PC in August '81 and the PC XT in March '83, IBM came out with several products that had technical weaknesses and were not fully compatible with the standards the company itself had created. As a result, these micros did not attract third-party development and they failed to meet end-user needs.

PCjr First on the List

First on that list of market misses was the PCjr home computer, which IBM finally introduced on Oct. 19, 1983, after months of intense industry speculation. The PCjr turned out to be an embarrassing failure for IBM for several reasons. First of all, the ill-fated machine was not PC-compatible and offered a very short supply of software. Delivery delays also contributed to the product's failure. IBM was unable to ship the PCjr in the fourth quarter of 1983, which turned out to be the tail end of the boom cycle in the home computer market.

The next problem product to appear was the Portable Computer, which IBM unveiled in February 1984. IBM had been convinced by Compaq Computer's success that portability was the way to go. Once again, however, IBM's new micro was not fully compatible with the PC and

In The Beginning

In August 1981 IBM unveiled the Personal Computer, changing the world of office automation forever. The entrepreneurial Entry Systems Division (ESD), Boca Raton, Fla., implemented strategies that at the time were counter to anything IBM had ever done. The daring division pursued a PC policy that advocated an open architecture, support of third-party software and peripheral developers, and a dependence on retail distribution. The introduction of the IBM PC, which reigned supreme from 1981 to 1983, showed that the team at Boca Raton had clearly done its homework.

A major part of that homework assignment consisted of analyzing the combination of factors that had made Apple computers such a big success at the low end. Perhaps ESD's short development schedule prompted it to veer off the proprietary path and seek third-party sources for key components of the PC architecture. The independent business unit then beat the bushes for a vendor to supply an operating system. ESD ended up with Microsoft, which, after several permutations, produced MS/DOS. The person behind the product was Microsoft chairman Bill Gates, who also helped convince IBM to incorporate a 16-bit microprocessor instead of the eight-bit processor that had been used in pcs.

The 16-bit entry chosen by IBM was the Intel 8088. Since the pacts for the chip and the operating system were nonexclusive, Intel and Microsoft were free to sell their wares wherever and whenever they wanted. They did, and as a result, the IBM/Intel/Microsoft architecture became the industry standard. Hardware vendors, following that standard, flooded the market with compatibles.

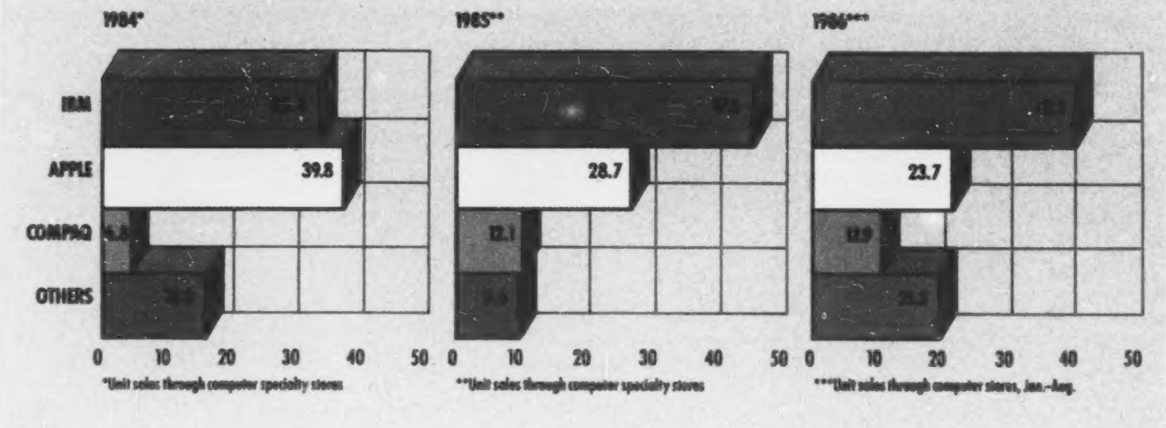
The potentially large installed base of PC and compatible products attracted the development talent of application software and peripherals vendors. Knowing that the newest and best applications would be developed first for the compatible systems, users literally put their money on this architecture, further solidifying the standard. Through its open architecture program, IBM aggressively sought the support of third-party developers.

The incorporation of the 16-bit 8088 set the stage for the emergence of the second generation personal computer architecture. The advanced performance of these systems in terms of memory, speed, and support of peripheral devices provided the necessary platform for software developers to produce more advanced business applications. Users, in turn, were able for the first time to see the real productivity pluses of pcs when they fired up such application software packages as the legendary Lotus 1-2-3 and dBase on their pcs.

ESD also broke the Big Blue mold when it decided to distribute its PCs through retail outlets. New dealerships sprang up overnight and the sales force that emerged promoted the IBM Personal Computer more enthusiastically and effectively than IBM's in-house team ever could have. After all, why would IBM salespeople want to sell a $3,000 PC when they could sell a $1 million mainframe? Since IBM's direct sales organization was not pushing the PC to the traditional buyer—the MIS manager and dp director—this group continued to ignore the importance of the personal computer in the office. Even mighty IBM didn't realize what a powerful force the little PC would exert in the office market or within the company itself.

BY MICHELE M. PRESTON

FIGURE 1 **PC Market Share 1984-1986**



it also didn't have features such as dual-mode display that Compaq offered. Approximately 120,000 of these machines were sold before it was discontinued in 1986.

Six months later, IBM took the wraps off the PC AT, which should have signaled the beginning of the third hardware product cycle based on the 32/16-bit architecture of the Intel 80286 microprocessor. Demand for the AT has been strong; it currently represents 20% of IBM's unit shipments. Yet despite that demand, an operating system that takes full advantage of the power of the 80286 chip has yet to be delivered.

During the past four years IBM has introduced other computers with the PC nomenclature, including the 3270 PC, the PC 370, and the RT PC. But these machines have had no real impact on the office market. As a result of this lackluster product performance, the bulk of IBM's PC revenues are still derived from sales of its Intel 8088-based systems.

By not pushing the state of the art, most of IBM's micro business is in the commodity market. The stability of the Intel 8088 architecture has created an opportunity for other vendors, both domestic and international, to gain market share by offering either prices or features that are better than IBM's. In 1985, IBM's unit market share peaked at 47.6%. By the middle of 1986 the company's share had dropped to 42%.

This market share decline coupled with the general slowdown in demand for personal computers has put pressure on this segment of IBM's business. Clone vendors with low-cost production or low-cost operations have gobbled up as much as 20% of the market by selling compatibles at prices that are as much as 40% cheaper than IBM's. Many of the low-cost production outfits are located in the Far East, while the low-cost operations concerns are usually mail-order distributors. Other firms, like Compaq, have tried to beat IBM at its own game by offering fully compatible products with higher performance. All this knife-sharp competition has done more than shave points off IBM's market share. The clone companies are in fact driving pc prices even lower, which puts still more pressure on revenues.

That pressure would not have been there if IBM had maintained control of the PC standard it created, which resulted in the grass roots implementation of microcomputers in office environments. The over 6 million IBM-compatible pcs installed in that environment means that users have made an enormous investment not only in terms of hardware and software dollars, but also in terms of time. These users, who may by now be pushing the limits of these systems, want an upward migration of the architecture to protect their investment.

THE MICRO STANDARD WILL NOT BE CONTROLLED BY IBM ALONE.

Although dp professionals are regaining control of purchasing decisions, the grass roots implementation of pcs that started several years ago has created a sophisticated user base that will continue to demand products that are fine-tuned to their needs. In the past, software developers played a key role in determining the success of hardware architectures. If the most popular applications were not available when needed, users simply did not buy these systems. In the future, the micro standard will not be controlled by IBM alone, but by a combination of interests—users, application developers, operating system suppliers, microprocessor vendors, and hardware manufacturers.

Office Environment Altered

The proliferation of pcs has not only radically altered the office environment, but has also presented corporations with significant problems in trying to tie personal computers into office systems and in supporting such a broad base of users and applications.

IBM is also trying to control its own micro direction. IBM never recognized just how significant the personal computer would be to the office market or to the company itself. As personal computers infiltrated the market, other IBM product and marketing divisions began to feel the impact. Because that impact has turned out to be so broad, microcomputer strategies are now being determined at even higher management levels within IBM.

What does all this mean to IBM's future? The company is at a crossroads. To regain its momentum in the microcomputer industry and recapture market share, IBM must make strategic changes in the way it has operated its personal computer business over the last few years. To begin with, those executives making the strategic decisions at IBM must begin to listen to the needs of end users.

The increasing sophistication of desktop users, combined with growing dissatisfaction among dp professionals, means that IBM's offerings will no longer be blindly accepted simply because they bear the IBM logo. The company must deliver real end-user benefits. The current confusion in the market creates an opportunity for someone—whether it's IBM or a systems integrator such as Electronic Data Systems—to step in and assist corporations in implementing office solutions.

IBM must once again start offering state-of-the-art technology that fulfills a market need. It must also add advanced features to its current systems, creating value that elevates it above the clone companies that compete on a price basis. Such features might include built-in communications protocols that aid micro-to-micro networking, micro-to-mini or micro-to-mainframe communications, graphics facilities that emulate state-of-the-art technology incorporated in Apple's Macintosh, and high-performance storage devices.

Last September Compaq took the lead in evolving the industry standard with the introduction of its Deskpro 386. The company decided to take such a bold step because it felt there was a need for a micro that delivered 80386-type performance. It also theorized that IBM would not be coming out with its 80386-based system until late this year.

In the meantime, there's been considerable controversy over what IBM's next micro move will be. Most speculate that IBM will come up with a proprietary system to eliminate the problem of clones. Salomon Brothers Inc., on the other hand, believes it is in IBM's interest to follow a value-added approach as Compaq has done in the past. This would conceivably take it out of the league inhabited by its clone competitors.

The distinction between a proprietary system and value added is a fine but important one. In the past, IBM has offered products that have been proprietary in varying degrees. All of them, including the RT PC, PCjr, PC Convertible, TopView, and the PC 370, have been unsuccessful. The reason for their failure was that they did not fulfill a user need. The advantages they provided were not sufficient to compensate for the fact that they could not operate industry-standard software and peripherals because they were not fully compatible. This obviously meant that software and peripheral developers would not commit development resources to machines that they did feel would earn broad enough user acceptance.

Success Depends on Three Factors

Regardless of the route IBM chooses—proprietary or value-added—the success of its new products will depend on three factors: whether the features meet real user needs, whether the products provide an upgrade path to protect users investment, and whether applications and peripherals users require to customize generic hardware for specific needs are available.

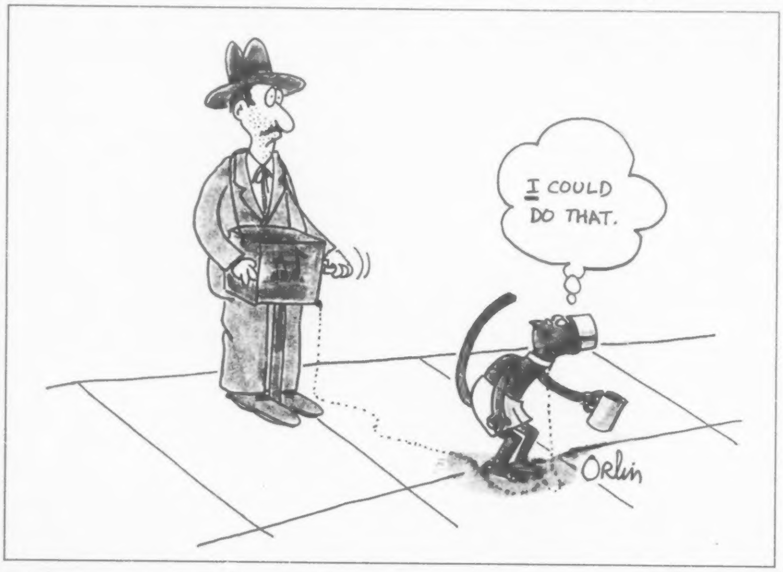
IBM also needs to resolve its micro dealership dilemma. The dealership system has resulted in the overdistribution of PCs, heavy discounting, and the emergence of a gray market of unauthorized agents. This has cut down revenues of even the best value-added dealers—dealers that IBM needs to effectively sell and support its large customer base. In an effort to consolidate distribution, IBM has placed a moratorium on authorizing additional locations. Its Customer Fulfillment Option also creates incentives for large accounts to purchase through the retail channel.

The company must take further steps to improve the quality of its distribution outlets. The majority of computer dealers, who do not have enough expertise to sell and support next-generation systems, will be lost when it comes to marketing the increasingly important total solutions envisioned by IBM in networking, communications, and applications. Even those dealers that do have the expertise are at risk because of the disarray and dissension in their ranks.

IBM must limit distribution of advanced systems to those channels that can provide strong customer support and end-user training. The company must also redefine the roles of these distributors and its own direct salespeople, so that the two sales forces are supporting, not competing with, each other.

Finally, senior IBM management must bite the bullet and determine the relative positioning of micros in the cooperative processing environment the company is attempting to build. IBM must make it clear to its corporate users that it has a cohesive strategy for offering information processing capability in a seamless fashion. Within that seamless framework are cpus, systems software, applications, and of course, communications from the desktop to the departmental work group and from the corporate database to the external database. The management responsibilities for executing such a strategy must be well defined. If so, IBM should be able to pump up its processing muscle in the microcomputer arena. ■

Michele Preston is a vice president at Salomon Brothers Inc. in New York.



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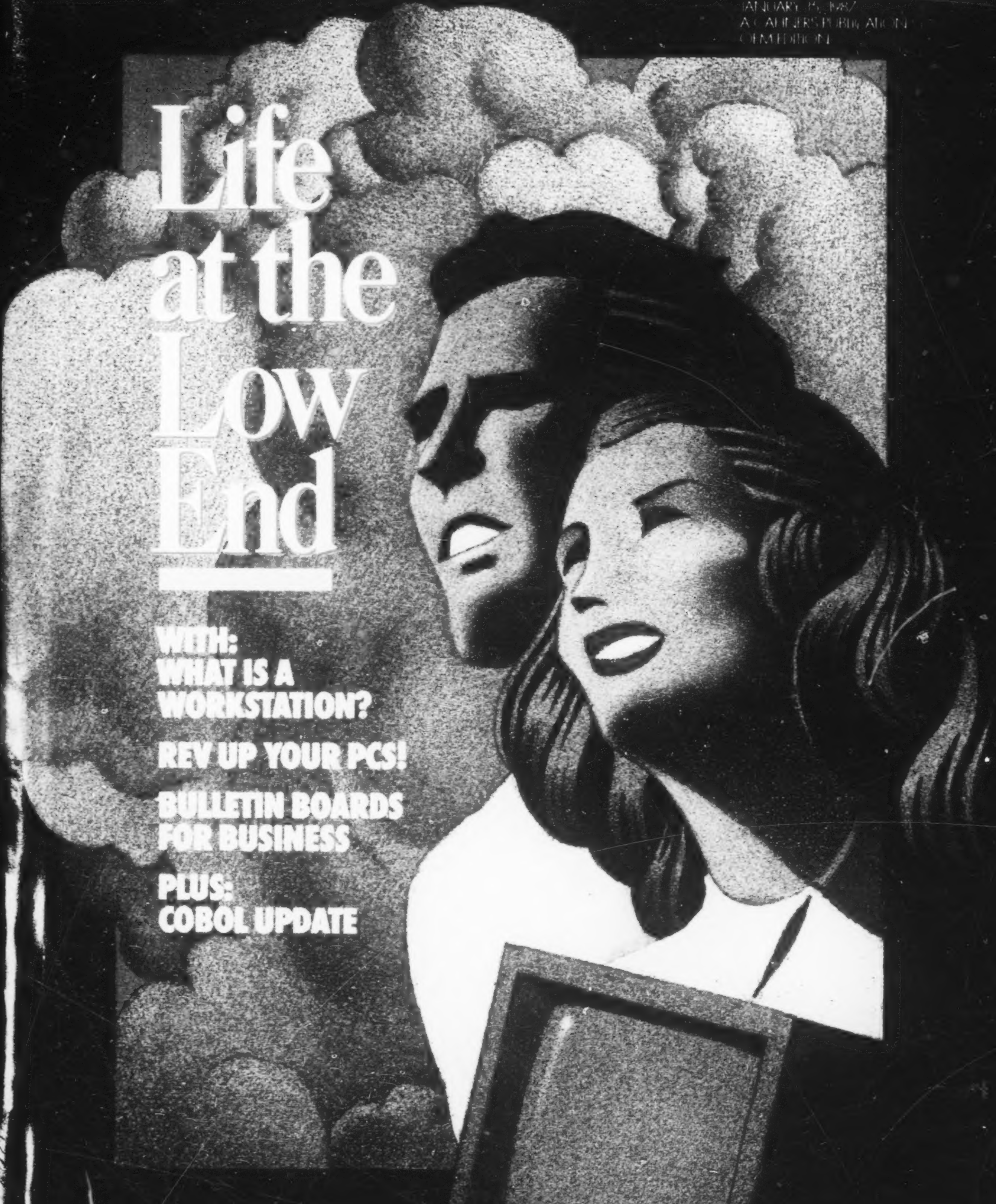

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Editorial

Lo! The Low End

Forecasts? Forsooth! All too often, forecasts are fraught with predilections instead of predictions.

Having said that, we now confess to falling prey ourselves to the forecasting mania. We recently asked our editorial advisory board, comprised of esteemed gurus and practitioners of all industry segments, to share with us their own looks into the future. The exercise brought home one truth: not all crystal balls are compatible!

But since pcs are the theme for this issue, we can't resist sharing with you the observations on that market from Robert L. Patrick, the longtime DATAMATION advisor and industry consultant based in Southern California. As you read through our pc coverage, keep in mind Bob's sage and sagacious words. They give new meaning to our theme of "Life at the Low End."

"The pc boom is over," Bob writes. "All the pent-up demand has been satisfied. Sure, there are more sales to be made—maybe five times the total of what has already been sold—but these will not be the emotional impulse buys of the past. Rather, buyers will be *demanding* ease of training and installation, some reasonable form of support (not yet invented), and only slight impact on the productivity of the office.

"The pcs have touched a large population. Productivity lagged mightily while we learned to use them. Intellectual discipline was eroded and now stands at an all-time low. It will be years before our business institutions catch up and recover organizationally from all the amateur computer users the pc spawned. The primary vendors gave no consideration to the organizational impact of so many MIPS and megabytes in the hands of the user. The resulting disorganization will take years to correct. I'm almost ready to label the pc a disservice to mankind (though I confess to using one to write this!).

"The field needs education, training, and people—not rank amateurs who can use a pc, but seasoned leaders to help us assimilate what we have and lay the foundation for the next surge. These people are in short supply and are hard to grow.

"Bank your fires. We've got two years of winter before spring."

Rebecca S. Barna

REBECCA S. BARNA
EDITOR

MERGERS

Are Three Heads Better than One?

"Niche marketing" is the battle cry of the new computer unit formed by Honeywell, Bull, and NEC.

BY SUSAN KERR

For Honeywell mainframe users, there's no question as to who's gaining the most from that company's sale of much of its computer business to Compagnie des Machines Bull of Paris and Nippon Electric Corp. (NEC) of Tokyo.

No, it's not the users. Nor is it Honeywell, which sold out for less money than many thought it could and should have gotten. Instead, some users quip, the grand prize winner is that old favorite, the Berlitz School of Languages.

"From what I've heard, a lot of Honeywell employees are taking quickie courses in French," says one user, who requested anonymity.

The common opinion of Honeywell followers and users is that it'll take more than proficiency in French to make this deal successful. Despite Honeywell officials' claims of "business as usual," Honeywell Information Systems (HIS) is going where no computer company has gone before. Its customers, employees, manufacturing facilities, and R&D labs are being swallowed up by the first computer entity owned jointly by U.S., European, and Japanese partners.

It may be the first with ownership that stretches east and west, but it's certainly not the first time a grand alliance has been formed to defend that increasingly rare turf known as the mainframe computer market. Unisys, to name the most recent example, has driven its flag into what it hopes is the high ground of the power of two. Unlike the Sperry-Burroughs conglomerate, Honeywell executives are not yet portraying themselves as potential IBM killers. Instead, the first order of business appears to be putting a stop to an eroding market share.

Honeywell, says Stan Lauck, president of the Honeywell Large System Users Association, "can't compete head-on with IBM as a mainframe vendor. They've stated they must coexist with IBM."

Lauck points out that HIS has been moving into niche markets. One is manufacturing, its parent company's strength. Others are local and county government and health care industries.

A Minicomputer Focus

HIS executive vice president Jerome Meyer, in a recent interview with DATAMATION, gives indications that that may be Honeywell's strategy. Much of the growth HIS is looking for won't come from Honeywell's traditional battleground: mainframes competing with IBM. Instead, HIS is counting on its recently announced DPS 6 medium-range minicomputers. "The mainframe market is growing at the 5% to 6% range," comments Meyer, "but all sorts of markets are spawning [elsewhere]. We are looking at our DPS 6 line as the product that takes us into new markets."

All three companies involved in this latest alliance have been longtime associates—NEC supplies Honeywell's top-of-the-line DPS 90, Honeywell owns more than 2% of Bull, Bull buys part of its DPS 7 computer technology from NEC, and so on—but joint ownership of a lagging computer company could be a unique challenge.

Meyer, while excited and optimistic about the new, as-yet-unnamed company of which he will be top manager, admits that "Clearly, NEC is a separate company and Bull is a separate company and they will have separate strategies. Honeywell, too, has its own strategies."

Funneling three parent companies' wishes, skills, and cultures into one company, therefore, is sure to be a challenge, but users say there really were few alternatives.

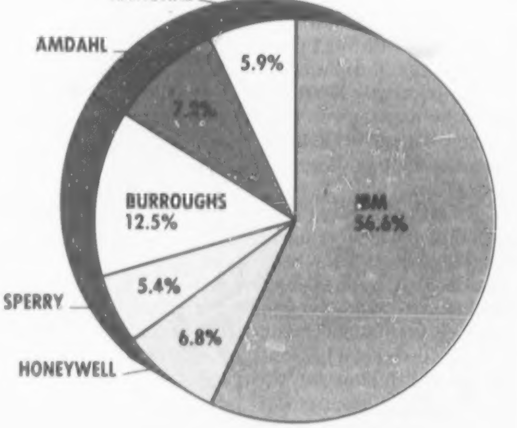
"It can't get any worse" than it was, says Kenneth Bodger, vice president of systems at McDonnell Douglas Corp., Torrance, Calif. "Honeywell hasn't had their heart in the computer business for the last four to five years and that was real obvious to the user. [Now] we'll have a commitment to doing a good job for the customer base that they'll want to protect.

"It will be interesting to see the remnants of the BUNCH and see how IBM takes advantage of it. And I'm sure they will. Users either want the security of the IBM name or [in some cases] some will feel foreign ownership is an issue."

As Bodger indicates, removing itself from day-to-day involvement with the sluggish computer industry has been a Honeywell goal. For the first nine months of 1986, HIS profits fell 39% from the same period a year earlier. By watering down its HIS interest, Honeywell is free to concentrate on its multibillion-dollar controls and aerospace concerns. To drive that point home, Honeywell recently purchased Sperry's aerospace unit for $1.03 billion.

Honeywell was so anxious to sell that for 57.5% (a 42.5% stake going to Bull and 15% to NEC) of HIS, it will gain only roughly $175 million in cash. Given HIS's 1985 revenues of $1.85 billion, the price Honeywell set "is a crime," says Kidder, Peabody & Co. Inc. assistant vice president Bahar Gidwani. Honeywell said late last month that as a

FIGURE 1 Mainframe Market Share



SOURCE: DATAQUEST INC.

result of taking a loss on the sale of a majority interest in Honeywell Information Systems to Bull and NEC, it would take after-tax charges against fourth quarter earnings of about $575 million, resulting in a 1986 loss of about $380 million.

A Fair Price?

Honeywell officials will say only that they think they got a fair price. Others claim NEC and Bull had slicker investment bankers, and that Honeywell, which so obviously wanted out of a languishing computer operation, was in no position to push up the price. Additionally, Francis Lorentz, Bull managing director, told DATAMATION in Paris that there was another potential buyer, which he refused to name.

"This operation was advantageous to both Bull and Honeywell [but we all were] in danger of losing out if the deal did not go through amicably," says Lorentz.

It's easier to see NEC's and Bull's interest in the venture. Neither wanted Honeywell in potentially unfriendly hands. By virtue of the pact, Bull and NEC each gains a ready-made U.S. distribution arm as well as easy access to Honeywell's blue-chip customer base of 10,000.

The three are in the process of sifting through product offerings and plans for possible overlaps. There are sure to be some, given their common computer platform built around the GCOS operating system.

A first possibility is that instead of each offering its own terminals, the new company will settle on one universal version, says Meyer. Another calls for NEC and Honeywell to settle on one personal computer offering for the U.S. Honeywell wants to offer NEC-designed compilers. There are many other such potentials for savings.

JEROME MEYER: Looking at niche markets.

Although the ties clearly are there, easy answers aren't. For now, HIS management will run the show, but Bull will have most of the say. A new nine-member board of directors will be set up, with Bull naming five directors, Honeywell three, and NEC one. Bull can, and probably will, pick up another 22.6% of HIS from Honeywell in 1988, say Honeywell insiders.

Bull control makes some nervous and Bull is sensitive to those concerns. "We will maintain the continuity of the existing management," says Lorentz. "There won't be many Frenchmen appointed to the company. Those that are sent over will be put there to strengthen relations. The firm must remain American."

Improvements Needed

One area that all Honeywell users say can stand improvement is new products. Although Honeywell over time has looked to remarketing products from Bull and NEC as a way to keep up-to-date, delays in enhancements is a loudly voiced criticism. For example, one user cites the seeming slowness in providing certain virtual memory capabilities—in particular, compilers for the GCOS 8 operating system. Another is that the new version of the DPS 8 system, first introduced a decade ago, is not expected to be unveiled until the latter part of 1987.

"Obviously the gain for the three of them is a collectively broader marketplace," says Bob Hench, vice president and general manager of information processing technology at General Electric Information Services Co., Rockville, Md., one of Honeywell's biggest customers. "The gain for us is that the stronger and healthier your vendor is, the better off you are. I'm also looking for a greater influx of new products."

Primarily, most users look to NEC to provide real technological leadership. Although not a concern of Hench's, others say their initial optimism for the deal was somewhat tempered by NEC's smaller than anticipated involvement.

A number of users contacted by DATAMATION say that when Honeywell first discussed the possibility of the three-way deal last fall, NEC was portrayed as becoming an equal partner.

"I guess I was hoping for a little stronger NEC participation," says Daniel Robert, senior vice president of information services, Coleco Industries, Hartford, Conn. "The only thing I can read into it is that it's all NEC had to put in to get what they wanted."

Although Honeywell officials say NEC did discuss a variety of equity positions, it is not known whether the Japanese giant planned all along to take no more than a 15% interest. The officials stress that NEC and Honeywell will continue work on a new high-end mainframe, a follow-on to the DPS 90, to be unveiled in the next few years. One of NEC's top goals in investing anything was making sure nothing interrupted that development or marketing of the current DPS 90.

Product development may be the easiest task for the new company. Marketing issues are a different matter.

The new consortium's first job is expected to be holding onto current customers and then attracting new buyers. Joe Alexander, Honeywell director of software product marketing, points out that NEC's emphasis has been on the engineering and scientific communities, whereas Honeywell has concentrated on commercial applications. HIS probably will follow NEC's lead and target more scientific users in the future, he says.

Applications Needed

A big task will be pressing for more third-party development, without which HIS is doomed. Even users association president Lauck comments that "One serious deficiency Honeywell had was application software. It will be an uphill battle. It's a matter of ensuring third-party vendors that the marketplace will be there. The R&D dollars the three companies can put together may be a big help."

[illegible]

"IT CAN'T GET ANY WORSE" THAN IT WAS.

But some current customers might not hold on. "I've not found Honeywell very reliable in what they say," charges Bobbi Ozier, chief of computer systems management divisions at the Army's Military Traffic Management Command, Oakland, Calif. "Releases, in particular of operating systems, take a long time." Her base is operating under a contract with

Honeywell that concludes in 1992. Pressed as to whether she'd choose Honeywell again, Ozier says, "I personally wouldn't."

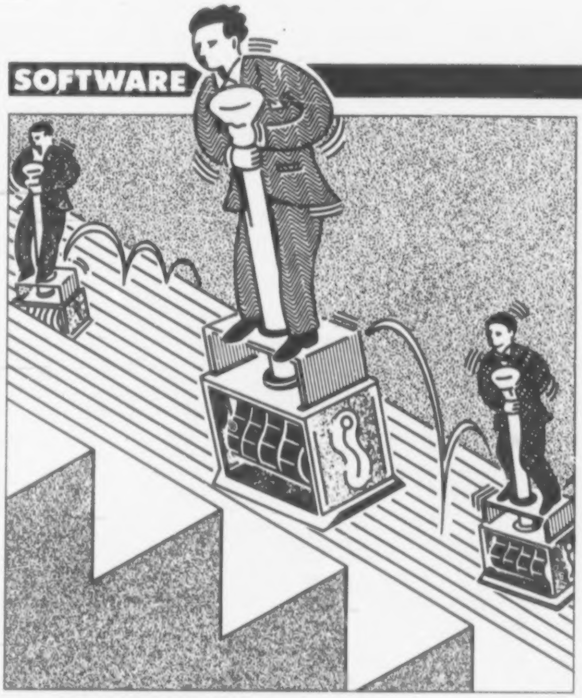
Honeywell may face competition within its own ranks. Honeywell is expected to be the largest customer for the new company, buying systems for internal data processing, reselling systems to the federal government (Honeywell's $250 million Federal Systems Division was left out of the deal due to concerns about foreign ownership), as well as bundling Honeywell computers with Honeywell control and industrial automation systems. As to the latter two, Meyer denies speculation that other Honeywell divisions will stop buying Honeywell gear once the deal goes through.

"There is documented commitment" that Honeywell will continue buying systems from the spun-out group, says Meyer. Yet, third-party developers say they are receiving cautious inquiries from other Honeywell divisions to the possibility of using external equipment. Roger Schell, president of Gemini Computers Inc., Carmel, Calif., is one of them. Gemini supplies Intel Corp. microprocessor-based systems to users with high-security requirements. Honeywell's Federal Systems Division is now "a potential customer. A year ago they weren't," says Schell.

Yet, Honeywell may have gained more than it lost. "To me," says Kimball Brown, a Dataquest Inc. industry analyst, "the three most 'feared' competitors of IBM are DEC, Tandem, and NEC. Though I don't think IBM's scared of anybody, these three present the chance of being problems. It should be interesting." ■

Correspondent James Etheridge in Paris assisted in the reporting of this article.

SOFTWARE



Taking the Cue from Big Blue

Independent software companies are picking up the beat of IBM's new software pricing policies.

BY JEFF MOAD

Users trying to determine exactly how IBM's October introduction of graduated pricing for mainframe software will affect their future software costs may want to wait a bit before totaling up all the pluses and minuses. If the signals coming from the industry's third-party software suppliers are any indication, MIS managers are going to have a lot more graduated pricing to factor into the equation later this year.

Most mainframe third-party systems software suppliers are planning to follow IBM's lead in switching from a policy of standard, one-time charges per product on VM and DOS/VSE systems software to one based on the power of a user's hardware, with users of larger systems paying significantly more than those running entry-level machines. That means by the third quarter of next year, when IBM starts shipping its new midrange 9370 system in volume, the majority of IBM VM and DOS users—those with 3083 systems and below—will enjoy lower one-time charges on systems software from third parties as well as from IBM. It also means users of large IBM 3081, 3084, and 3090 systems running VM and DOS will face higher one-time price tags on all systems software as third-party companies copy IBM in raising charges to high-end users to compensate for price cuts at the low end.

And it looks as if VM and DOS systems software pricing isn't all that will change. Most third-party software vendors contacted recently by DATAMATION expect graduated pricing to become the norm for applications programs as well as systems software. Moreover, all indications are that graduated pricing eventually will make its way into the MVS/XA and MVS/SP operating system environments.

First to react will be systems software third-party vendors with products running under VM and DOS/VSE. Companies such as VM Software, Reston, Va., and Computer Associates, Garden City, N.Y., are actively planning to adopt pricing policies based on cpu size. "We have already decided we're going to participate in the 9370 market, so we pretty much have to go to some kind of value-pricing structure to compete," says VM Software marketing vice president Ronald Kral. "It's one thing to sell a $50,000 piece of software to someone running a $7 million 3090, but someone running a $300,000 9370 is going to say, 'Wait a minute.' We have to consider lowering the price if we want to sell to him, which we do."

Cuts at the Low End

Likewise, Computer Associates "probably will do something to come up with value pricing based on system size," says ceo Charles B. Wang. "We have to do something if we don't want to end up out of line with hardware prices at the low end." Both Kral and Wang say their companies are likely to have graduated pricing in place by IBM's 9370 shipping date.

Also drawing up graduated pricing plans are third-party vendors Sterling Software Inc., Dallas; Pansophic Systems Inc., Oak Brook, Ill.; and Cincom Systems, Cincinnati. Eventually, says analyst Scott Smith of Donaldson, Lufkin & Jenrette Securities Corp., "They all [third-party soft-

ABSTRACT

If IBM's competitors can offer nationwide service and support, reducing the risk to resellers, vars will be even more "pro-choice." Compatibles from AT&T, Compaq, Unisys, Zenith, and other clone makers comprise approximately 36% of the systems resellers carry. As part of its new pitch to vars, Apple emphasizes its investment in getting applications written for the Mac. Resellers offering alternatives to IBM often install Big Blue's PCs only when the customer demands them.

Micro Dissent

BY ESTHER SURDEN

"We're mad as hell and we won't take it any more."

So say the exasperated prime-time tv viewers in the movie *Network*. Like those viewers, value-added resellers are telling IBM and the compatible makers to shape up.

Vars are defecting from Big Blue's micros to more cost-effective compatible boxes, forsaking the IBM brand name and with it, the company's restrictions on who can be a var. They are also organizing to present a single voice to the industry so they can influence the kind of equipment manufacturers offer and the margins they receive on systems sold through the third-party channel.

Whether or not IBM is listening to the grumbling in the industry is anyone's guess. But the sheer number of vars who are electing to go to IBM's competitors should make all vendors sit up and take notice.

IBM IS NO LONGER A PREREQUISITE.

Timothy Williams, director of channels and market analysis for Dallas-based Future Computing Inc., says that when end users are willing to live without IBM's label, vars will be on the lookout for better margins. If they can avoid IBM's bureaucracy and rules, they will. Further, if IBM's competitors can offer nationwide service and support, vars will be even more prochoice.

Resellers are becoming increasingly militant about the treatment they are receiving at the hands of all vendors, and IBM seems to get the lowest marks, adds International Data Corp.'s var market analyst Kenneth Hoyt. "Many var programs are there just to act as pacifiers to the [resellers] when, really, very few [vendors] care very much about the interests of the vars.

"Certainly, vars have been squeezed on margins and had policies instituted so that cross-channel conflict is increased rather than reduced," says Hoyt. "Obviously, the margins are better with IBM PC clones, and if resellers are not going to get anything in addition to the margins—such as a partnership—there is no reason for them to stay with the big brand-name manufacturers."

Mark Forrest, executive director of the Society of Industry-Oriented Professionals (SIOP) in Bristol, Pa., an organization recently formed to promote the interests of resellers, echoes Hoyt's concerns: "In general, vendors consider the reseller channel not to be a channel at all, but rather an interference with their two primary methods of doing business—the retail store and direct sales. IBM is doubtless the worst offender, but it is not the only offender. Right now, we represent some $20 billion to $30 billion worth of business, and we believe that where there were two channels, there will soon be three."

SIOP maintains that by banding together, resellers can persuade manufacturers to provide the bells and whistles they need on the machines they sell to end users and to deal fairly with the reseller channel. A hidden threat to the society, however, is that vars with a great deal of business will avoid the major manufacturers and let contracts overseas to have systems built to the resellers' specifications.

"While the number one reason we've chosen to go with compatibles is price/performance, a secondary reason is availability," says SIOP member Richard R. London, president of London Computer Inc. in Bristol, Pa. "IBM just doesn't make it easy for anyone to become an IBM dealer. It wants some very large and, in our opinion, unreasonable sales commitments in order to carry [the IBM] product. We are able to sell systems from ITT, Sperry, and AT&T without committing a quarter-million or a half-million dollars to a particular computer model." London adds, "The compatibles are coming out with enhancements faster than IBM is."

Open Architecture May Close

Always lurking in the background, of course, is the possibility that IBM may begin to close what has been an open PC architecture, leaving vars who develop systems around compatible machines out in the cold for the next generation of personal computers. Some observers say that the agreement executed in September between Intel Corp. and IBM for semiconductor technology exchange could lead to custom-made PCs, creating longer and more costly development cycles for clone makers and confusion among vars who have gone with compatibles.

Indeed, compatibility with a previous system is the leading reason why users choose a particular personal computer, according to the results of the 1986/87 DATAMATION/Cowan & Co. Institutional Services mini/micro computer survey (see "Minis, Micros, and Maturity," Nov. 1, p. 65). The survey also shows, however, that IBM PC compatibles have benefited from a shift in priorities by users.

Specifically, price is a significantly more important factor than it was a year ago, the survey finds. Price is second only to compatibility with a prior system and, for the first time, ranks ahead of the availability of software. Product reputation and supplier viability, two of IBM's long suits, also dropped in importance. Although only about 8% of the 6,886 survey respondents were vars, resellers also consider price a major factor in choosing a system to market.

A recent survey of nearly 2,900 vars conducted by Future Computing confirms that resellers are beginning to favor the lower-priced microcomputer alternatives. This survey found that compatibles from AT&T, Compaq, Sperry, Zenith, and other clone makers comprise approximately 36% of the systems resellers carry—a respectable turnout for machines that aren't supposed to have made much of a splash in the third-party channel. The rest of the vars mentioned minicomputers, noncompatibles, or multi-user systems like Altos. Significantly, the one vendor identified by DATAMATION's survey of mini/micro users as the only real alternative to IBM—Apple Computer Inc.—came up short in the Future Computing var survey.

That's probably because vars who operate through retail channels, Apple's primary third-party outlet, are underrepresented in the files, says Erna Arneson, formerly with Future Computing and now manager of Apple's var channel. Until Arneson was brought on board, Apple's approach to resellers was low-key at best. Some people wondered if the company actually had a var program at all, although one was formally initiated in 1983-84, and salespeople were out there selling to vars.

BRAND LOYALTY IS BATTERED BY PRICE.

"There was not much depth behind it," Arneson admits. "It was just a nominal effort to recruit vars or to put the companies that were not retail into a distribution group. Last year, beginning in October, was the first time Apple made a large commitment in terms of staff and resources," and put the full weight of management behind pursuing vars.

Apple is aware that it doesn't have the kind of broad product line that usually appeals to vars, or the kind of product line that can really compete head-to-head with IBM in broad-based industries. As a result, the company will concentrate its efforts in industries where Apple products have an edge. According to Arneson, these include design-oriented industries, such as fabric design, architecture, and housing layouts, where the graphics features of the Macintosh may make it desirable for a var to use a closed system like the Mac as opposed to the open, MS/DOS-based PC compatibles.

Emphasizes Mac Applications

As part of its new pitch to vars, Apple emphasizes its investment in getting applications written for the Mac. "We have a really strong developer support program," says Arneson. The firm has created special conferences for vars and developers. In fact, Arneson notes, "all vars become developers once they sign up, so they get technical notes, technical communiqués, and become part of the AppleLink communications network."

Apple recently set up a fund that resellers can draw from to do their advertising. "They can spend up to $5,000 pre-accrual dollars," says Arneson. Also under development is a davar (dealer-associated value-added remarketer) program, designed so that smaller vars can go to dealers and both will have their margins protected.

Apple reseller Roy Endres, vice president of marketing for Peoria, Ill.-based Multi-Ads Services Inc., is one reseller who spurned IBM and the compatibles because of the technical qualities of the Apple product. Endres gives high marks to the machine's user interface, which enables people to be "productive in a short period of time.

"We give our users a two-day seminar, and they are up and running on the machine," he says. Multi-Ads places the Macs in the advertising departments of newspapers, magazines, and radio stations so that media managers can search a database of cooperative advertising in order to design customized ad programs for potential retail clients.

Endres isn't worried that the rest of the world operates in MS/DOS. "It's not really a problem. Not one of our users has told us they'd like to run their MS/DOS programs on it." In fact, he argues, resellers ought to look at the application and choose the right machine for the job, rather than worry about de facto standards.

Like Apple, another company that didn't show up in the Future Computing study was Tandy Corp. Yet the Fort Worth-based company is also pursuing resellers aggressively and says it presently has between 200 and 300 on its roster.

Tandy sells largely through its retail Radio Shack Computer Centers, although it has created special programs for vars. "Vars shouldn't come to us unless they want to make profits on their products," boasts Jim Roberts, manager of value-added resellers for Tandy.

"We are in a unique position compared with other manufacturers, in that since we own such a giant retail distribution network, we have a lot to say about the street price of the product," Roberts comments. "Other manufacturers can only establish a list price and some sort of agreement to establish a discount off of the list. But the street price has nothing to do with the suggested list."

Tandy also provides nationwide service through its own service facilities, a plus for some resellers who prefer to deal with the company selling the hardware rather than a third-party maintenance contractor or freelance repair personnel.

The chief reason why Stenograph Corp., a marketer of transcription systems, decided to do business with Tandy rather than IBM is that Tandy is more interested in doing business, says Brian E. Boyd, vice president of marketing services for the Chicago-based var. Tandy exhibited "an eagerness" to provide the hardware, Boyd says. Tandy also provides "discount levels early so you can go out to get the hardware" as soon as possible.

"We also believe we get more box for the dollars. The Tandy product we use is faster than the AT," he adds. Asked about product availability, Boyd says it isn't a problem.

Stenograph went through almost all of the steps to become an IBM-approved dealer and can offer its court reporting system on IBM AT hardware. But customer acceptance of the cheaper Tandy-based system has been great. "We've been selling these since the beginning of August, and no one has asked for IBM," says Boyd.

Of course, compatibility was a factor, because Stenograph's customers needed to be able to run IBM-compatible software and they also needed to be able to deliver their manuscripts on a formatted diskette. The Tandy product fulfilled those needs.

Same Program to Vars, Dealers

Still another microcomputer manufacturer, Panasonic Corp., Secaucus, N.J., offers its 125 vars the same program it makes available to its dealers: volume discounts, co-op ads, and promotions. In addition, the company provides one year of technical support, gives vars the right to purchase service kits, and offers a 24-hour component swap if something goes wrong. Third-party service is provided through Diebold.

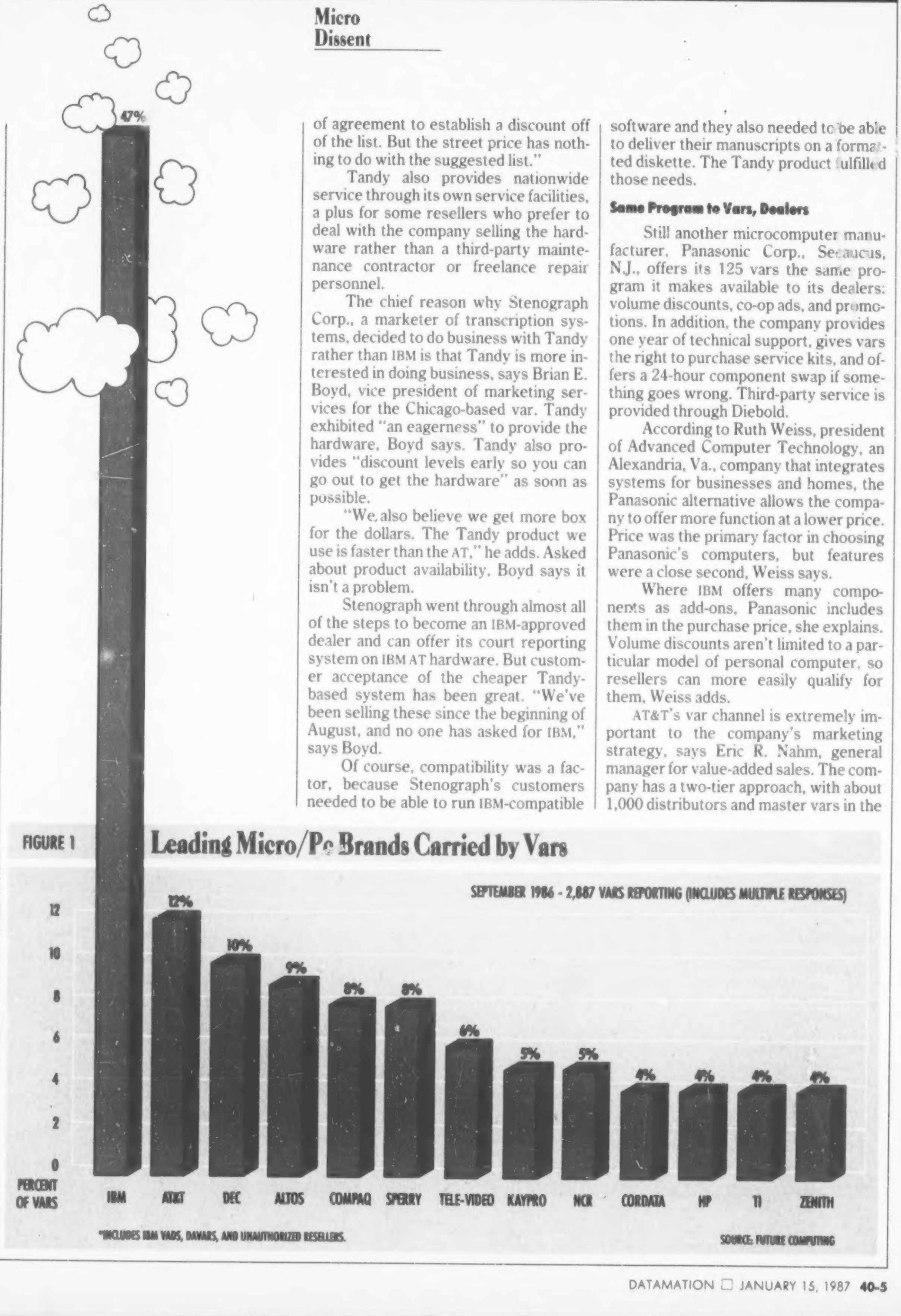
According to Ruth Weiss, president of Advanced Computer Technology, an Alexandria, Va., company that integrates systems for businesses and homes, the Panasonic alternative allows the company to offer more function at a lower price. Price was the primary factor in choosing Panasonic's computers, but features were a close second, Weiss says.

Where IBM offers many components as add-ons, Panasonic includes them in the purchase price, she explains. Volume discounts aren't limited to a particular model of personal computer, so resellers can more easily qualify for them, Weiss adds.

AT&T's var channel is extremely important to the company's marketing strategy, says Eric R. Nahm, general manager for value-added sales. The company has a two-tier approach, with about 1,000 distributors and master vars in the

FIGURE 1

Leading Micro/Pc Brands Carried by Vars



SEPTEMBER 1986 - 2,887 VARS REPORTING (INCLUDES MULTIPLE RESPONSES)

*INCLUDES IBM VADS, DAVARS, AND UNAUTHORIZED RESELLERS.

SOURCE: FUTURE COMPUTING

top tier and about 200 direct vars on the second level. To be an AT&T var, resellers have to do about $2 million in business annually. While most vars sell the Unix products, many also sell AT&T's IBM-compatible pcs.

"We have broadened the program so our resellers can sell our entire product line, and discounts are based on an aggregated contract," says Nahm. "We encourage them to focus on vertical markets and both the large and small participants in these markets."

AT&T recently strengthened its var channel by discontinuing standalone direct sales from the company. The direct sales force now refers all inquiries to resellers and receives commissions for doing so. Thus, AT&T salespeople aren't competing with the firm's var channel.

In a world where vars are constantly searching for products that will give the best price/performance, AT&T wins hands down, says Kenneth Pond, president of the PROCOM Group Inc., New York.

Pond will continue to provide his general purpose business software on IBM systems when, for compatibility with existing systems, a customer demands he do so. But for new users, PROCOM clearly prefers AT&T products. Much of PROCOM's work involves communications, which is much easier and more cost-effective to implement on AT&T computers, Pond points out.

While product price and performance were PROCOM's reason for choosing AT&T, the company's ability to pass technical expertise on to its vars was another. "It's without parallel in the industry," Pond declares.

Further, he's sold on AT&T's approach to vars. "IBM has constricted the reseller channel by trying to impose the standards of an IBM blue label on all var products through their extensive approval methods," Pond explains. AT&T, on the other hand, "has successfully engaged the market," he says. "AT&T qualifies reseller organizations but doesn't try to approve their software the way IBM does."

Marbeth Shay, another AT&T reseller, suggests that the viability of a company should be the primary selection criteria. Shay, who is president of East Coast Computer Systems in Red Bank, N.J., has cast her lot with AT&T's Unix systems. "Products come and products go—so you'd better go with the one that will be around the longest," she says.

Has No Policy for Vars

Compaq Computer Corp.—the leader in the compatible industry—has no value-added reseller policy. The company authorizes dealers but has no way of tracking who adds value to what. Nevertheless, an increasing number of Compaq users are value-added resellers, whether the company acknowledges this or not. Sometimes, they pass as dealers; other times, they are volume users who purchase through Compaq dealers.

Still another popular clone maker, Zenith Data Systems, is just now reaching out through its dealer network to find out who its vars are and expects to have a formal reseller program set up this month.

All of these manufacturers are finding themselves in a world where brand names mean less and less. Wilson Thom-

You'll see a lot of this family on the IBM Channel.

Catch IBM Channel errors in the act.

DW300 Channel Monitor

The DW300 Channel Monitor is a unique logic analysis tool designed especially for monitoring the IBM and compatible mainframe I/O Channels.

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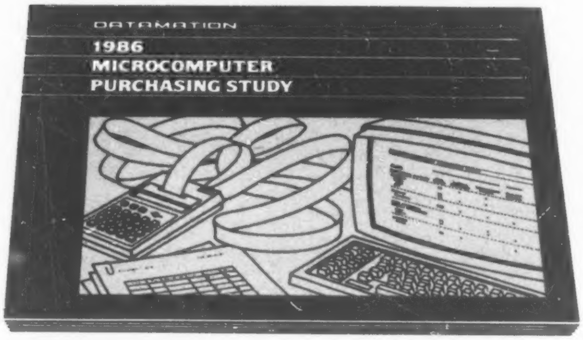

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as, president of Dart Technologies Group in Houston, is typical of a reseller who has no brand allegiance. His main criterion for selection of equipment is what his customers in the insurance, construction, and personnel industries will accept.

As a result, Thomas has installed systems from Compaq, Leading Edge, and, when nothing but the IBM label will do, from Big Blue. "Sometimes we go with IBM, but other times they'll ask us to use the cheapest thing we can find," the reseller says. Compatibility is rarely a factor any more, he notes. Occasionally, graphics packages have problems transferring from one compatible machine to another, but Dart's accounting-oriented software does not.

Since Thomas doesn't achieve the volume necessary to qualify for discounts from the vendors, he makes his deals with local computer retail outlets. "We have an agreement with the computer stores that, in exchange for a discount, we don't worry them with service and support. We take care of our own problems." Service is provided either by the user if he is sophisticated enough to handle it himself, or by freelancers to the local customers—arrangements that seem to work out well.

Cheaper Systems May Open Doors

Vars may find that choosing a less expensive system may open more doors for them, getting their systems into companies that might not have considered automating at a higher price. Los Angeles-based Technoplan Corp. is one reseller that has taken this route.

Technoplan recently qualified for the Leading Edge var program. The primary motive for choosing the non-Blue label? David Hashemi, partner in the company that provides construction and service station systems, says, "The evolution of the market has reached the point where people are educated enough to see that there is actually no difference between the Blue Chip computer and a clone." He adds, "It was so hard for so many companies to justify the purchase of a system at $18,000 to $20,000, with value added. The price can be brought down into the $10,000 range, a much more easily justifiable number when a compatible is used."

Hashemi and his brother, Ken, have installed IBM computers in situations where the customer has demanded it. "Usually, if a company has a CPA, they won't go with anyone but IBM. But when we are dealing directly with the president of a small firm and can demonstrate considerable savings to that chief executive, we can go with Leading Edge." ■

Esther Surden is a freelance writer and editor based in Guttenberg, N.J.

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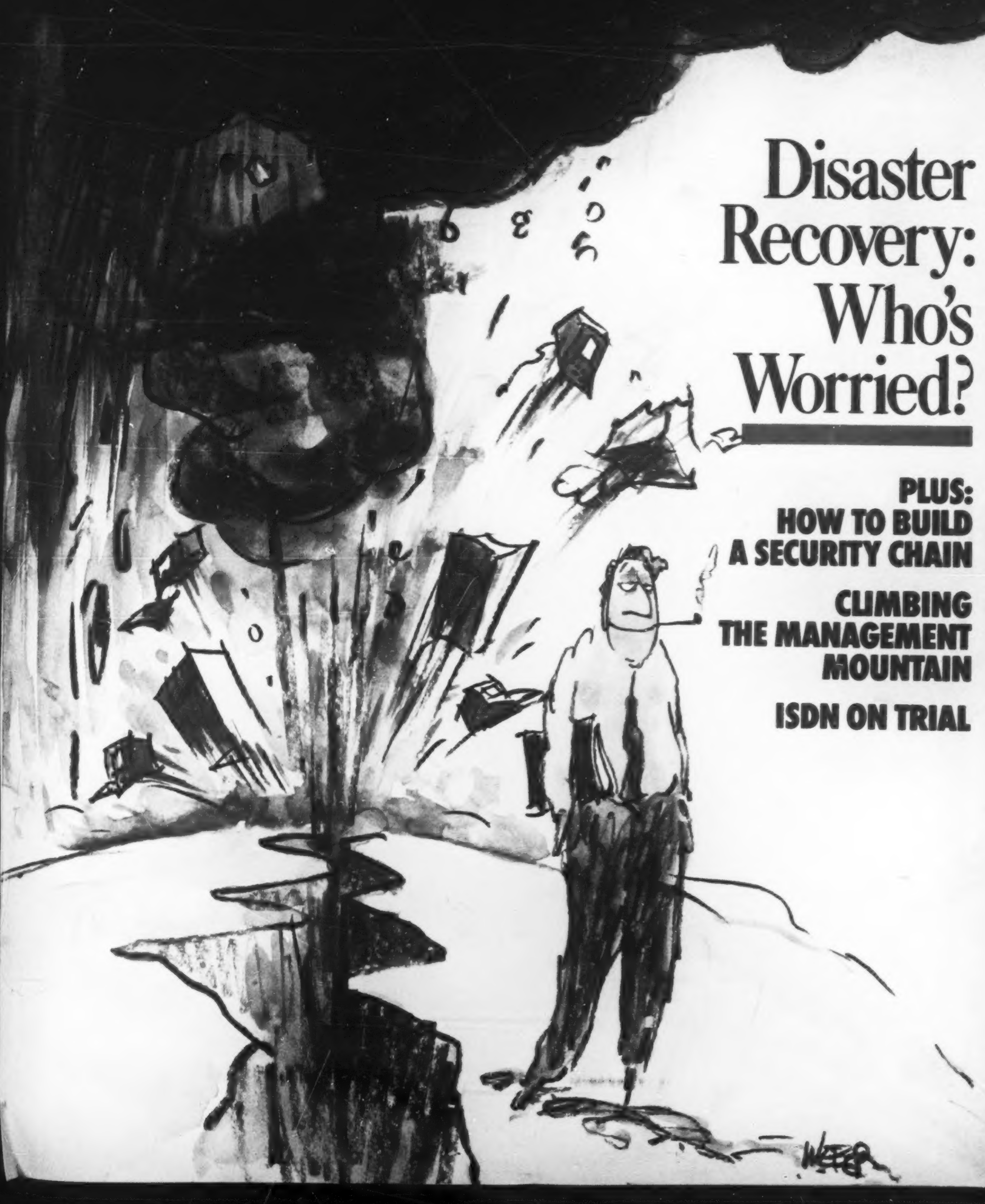

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Editorial

The Short Side of Short-Term Focus

Downsize. Maximize near-term results. Together these form the foundation of the new American business credo. The new thinking is making Wall Street happy, stockholders wealthy, and helping to keep corporate raiders at bay. It has also cost thousands of Americans their jobs and, if it continues unchecked in the information processing business, it may well cripple this industry's long-term future.

In themselves, downsizing and the pushing of quarterly profits are not dangerous or even wrong. For many companies in the industry, the credo makes a good deal of sense. The computer boom of the late 1970s and early 1980s and its heady sales often left even the smartest executives with bloated organizations and obsolete product lines.

The targets of downsizing, though, are too often research and development and new product engineering. These are the very elements that when nurtured ensure a future beyond the next quarterly statement. They are also, unfortunately, among the easiest budgets to cut and provide the fastest jump in short-term profits.

That understanding hasn't escaped even the biggest corporations in the business. AT&T's recently announced plan to cut nearly 28,000 workers and write off $3.2 billion against earnings directly targets development positions in its Communications and Information Systems Group and reductions, through attrition, of research positions at the company's Bell Laboratories—an organization that could be called America's national treasure for research.

IBM's early retirement program, affecting 10,000 and aimed at saving $1 billion a year, includes its own highly renowned chief scientist, Lewis Branscomb. AT&T and IBM aren't alone. Virtually every company in the business has adopted a downsizing strategy, and too many are attacking their scientific underpinnings to pull it off.

Cost-cutting is necessary, but attacking the scientific and engineering cornerstone of the industry must cease before its short-term dreams turn into long-term nightmares.

GEORGE DAVIS
EDITOR-IN-CHIEF

and put pressure on French officials, the government in Bonn referred the proposed merger to the West German Federal Cartel Office for a review of the competition issues involved. Though the office has given a general goahead to the deal, it is still trying to work out the details.

Meanwhile, in support of AT&T, the FCC threatened to impede Siemens' progress in the U.S. switching market by imposing tighter restrictions on the award of public switching contracts to foreign suppliers.

A Slice of the Market

Though CGCT's future may still be uncertain, the battle for control of a minority share of this small French supplier demonstrates the desperation of telecommunications companies to gain a firm foothold in Europe. The reason is simple—they all want a slice of Europe's growing telecom market.

Following the European Commission's recommendation that members build an ISDN between 1988 and 1993, tenders from many countries' PTTs are expected to go out over the next three years. This call for new technology will speed standardization among suppliers, but the real crunch will come in the mid-1990s, when PTTs expect to install a further generation of technology in the form of broadband switches.

SCS's Arnold believes that no existing companies will be strong enough to meet this demand. "Companies will then have to be joined together. U.S. competitors will be very threatening, but Europe has a good chance of holding onto its own markets if governments and suppliers fully understand the infrastructure of Europe's telecommunications and the meaning of liberalization."

Also facing this daunting challenge are a number of smaller European telecom companies—Italy's Italtel and the U.K.'s Plessey.

Like other European manufacturers, Italtel has little choice but to attach itself to a major supplier. For the Italian company, that is an invidious position since it was a founding member of the Big Four group with France's CGE/Alcatel and the U.K.'s Plessey and GEC. The group was set up in 1984 to promote the development of common switching technology and, later, cooperative marketing. It foundered when the CGE-ITT and Siemens-GTE accords were struck. CGE's acquisition unbalanced the venture and Siemens' accord with GTE rankled Italtel, whose Linear UT switch was originally based on GTE technology.

One option open to Italtel and its smaller colleagues is to join the CGE-ITT venture. Belgium's Société Générale de Belgique and the Spanish PTT company Telefonica are considering joining. Plessey, GEC, and Italtel's state holding company Stet each turned down an invitation to join, however, because they would not get an asset stake.

The trouble for these smaller suppliers is that if they don't make European pacts, they will be vulnerable to larger predatory suppliers. Sweden's Ericsson, for example, is taking a keen interest in Italtel. Canada's Northern Telecom, meanwhile, was rumored to have approached ITT about its European operations at one stage, and is still eager to forge new agreements in Europe.

But if Europe's telecom vendors are to be among the victors over the next decade they must choose partners carefully. "Get fit, rationalize [streamline], seek opportunities beyond your domestic market to remain profitable, and find partners to share your technology costs," counsels Dataquest's Mier. ■

TERMINALS

New Rules for an Old Game

As IBM ships a new and cheaper terminal, plug-compatible vendors face new opportunities and pitfalls.

BY ROBERT J. CRUTCHFIELD

If it didn't say "IBM" on the 3191 terminal, users might mistake Big Blue's latest offering for the plug-compatible competition. Unlike its predecessor, the 3178, the 3191 actually adopts some of the competition's features—it's smaller, has ergonomic features, and, most important, it has a sharp price.

As a low-cost display, the 3191, which was introduced last June and just began to be shipped in volume last month, is poised to compete against the lower-cost competition. The new terminal has a much smaller footprint than previous terminal offerings as well as an improved display and keyboard, and it has an optional three-year warranty.

"The significance of the 3191 is that it is designed to be inexpensive. It is built from the ground up in a fully automated facility," says Joe Wagner, an analyst for Dataquest, a research firm in San Jose. "The terminal gives IBM room to cut prices."

Sharper pricing, automated manufacturing, an optional three-year warranty, and more features have forced plug-compatible vendors to play the game by a new set of rules.

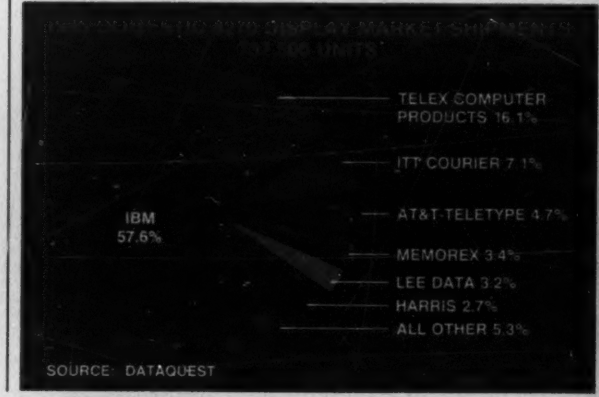
Offshore manufacturing isn't enough. To play the new game, plug-compatible vendors must match IBM's features and warranties while offering their products at a lower price—and still at a profit.

This is not an easy task in today's market. The 3191 lists for $1,200. An MIS executive for a large energy company, however, says he has been offered the product in large quantities for $600 each.

"We have heard reports that the 3191 is being discounted," says Irene Goldman, an analyst at International Data Corp., Framingham, Mass.

At press time, IBM was unavailable for comment on 3191 pricing.

Dataquest estimates that in 1985, IBM and the rest of the 3270 terminal vendors



SOURCE: DATAQUEST

shipped 737,500 terminals. That number rose 11% in 1986 to 833,000, but despite the jump in terminal sales, dollar volume for the year dropped to $1.42 billion from $1.48 billion in 1985.

According to analysts, IBM has remained a formidable competitor in the terminal market, although in 1985 it slipped one percentage point in market share to the plug-compatible competition, mainly Telex. In 1985, IBM had 57.6% of the 3270 market, followed by Telex with 16.1%, ITT Courier with 7.1%, AT&T-Teletype with 4.7%, Memorex with 3.4%, Lee Data with 3.2%, Harris with 2.7%, and the remaining companies with 5.3%.

Competitors Strike Back

But even in this new era where more terminal shipments mean less dollars, some plug-compatible vendors are holding their own.

Instead of going offshore for margins, Telex Corp., headquartered in Tulsa, Okla., has made a large investment in a fully automated terminal manufacturing facility in Raleigh, N.C., and an automated distribution and repair center in Tulsa.

Last week, Telex introduced its entry into the 3191 market, the Telex 191, which will initially be available only in the U.S. Like the 3191, it is built in a completely automated facility to keep costs down. The 191 attaches to either a Telex or an IBM control unit. It offers an 88-key keyboard or a recently announced 122-key keyboard. An added optional feature is the ability to attach a light pen or a message printer. The 191 lists for the same price as its IBM counterpart, with a 90-day warranty.

According to Mike Bowman, product manager for Telex's 3270 terminals, the company will be competitive with IBM on volume discounts and warranty periods, which run as long as three years.

Other vendors to enter the 3191 market include Beehive International (with an enhanced 3278 offering) and Memorex, both in San Jose. ITT Courier, also in San Jose, is readying its 3191 entry for a March announcement.

"It is an overriding situation. Plug-compatible vendors must have a 3191-compatible product because that is now the entry point for 3270 terminals," Wagner says.

As terminal prices drop, plug-compatible vendors have to look to other segments of the market to make up for slipping 3270 margins.

"Telex has expanded into new markets that complement and expand our 3270 [offerings]," says Pat Reiner, vice president of marketing and product planning for Telex. "For example," she says, "in July of last year, we announced a new series of airline [reservation] terminals. In September we introduced the C078 voice/data terminal, and in November we entered the System 3X market with nine new products."

"THE TERMINAL GIVES IBM ROOM TO CUT PRICES."

Analysts also say that specialized products like the voice/data terminal and airline reservation terminals can still command higher prices and margins for Telex. Companies such as Lee Data, Minneapolis, and Memorex are the only terminal vendors now offering a more diversified product line.

Another area in which Telex is doing well is control units. At the time of the 3191 announcement, IBM also said it would add multiple sessions and windowing capabilities to its control unit, but Big Blue has yet to offer a control unit with these features. However, analysts say IBM is readying products with these features for release sometime in the first half of this year.

Taking Advantage

In the meantime, companies such as Telex are taking advantage of the time by bringing out products that match IBM's direction.

Telex recently introduced its 274 control unit with windowing, which allows 3270 terminals to configure up to four displayable windows of four different host sessions. Data can be copied from one window to another, even if one of the windows is an ASCII host session. The control unit also supports the IBM 3179G graphics support feature, which enables an attached 3179G to use the all-points-addressable (APA) graphics support available from the host computer.

According to Telex's Bowman, when his company incorporates announced features from IBM, as in the case of the control unit, the vendor must adhere to strict compatibility.

"These vendors don't want to jepordize their plug compatibility. They don't want to extend themselves too far away from IBM," says IDC's Goldman.

In the short term, IBM is taking a very aggressive posture in the 3270 business as it attacks its competition's strongest selling point—price. But, until IBM can deliver all it has promised in the area of control units, there is plenty of room in the market for the plug-compatible vendors. ■

LANGUAGES

What the Countess Didn't Count On

Ada continues its slow march to the dp world, but can it shake off the DOD image?

BY EDITH D. MYERS

Ada, the Department of Defense-mandated programming language named for Ada Augusta Byron, Countess of Lovelace, is hardly topping the wish lists of corporate MIS managers.

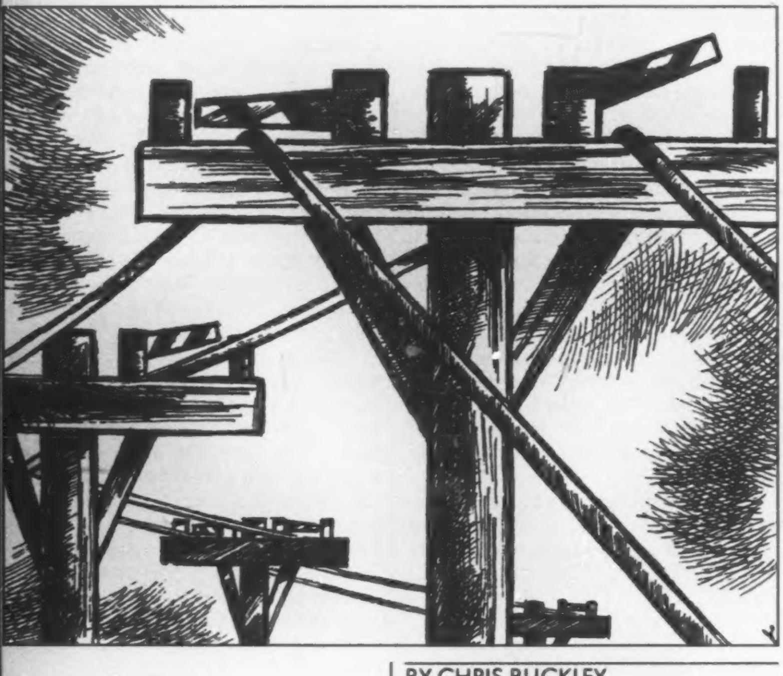
There are those who think it should and those who think it someday will (see "Ada Fans Say Now's the Time," May 15, 1984, p. 38), and there are some things happening that could propel the language into a prominent position in the world of commercial data processing. Foremost in most minds was IBM's seeming endorsement of the language when it leaked news at a SHARE meeting in August that it would be offering Ada compilers and productivity tools for 370 systems running under MVS and VM/CMS. This disclosure eventually materialized as an agreement between IBM and Telesoft, San Diego.

Despite the IBM imprimatur, Ada apparently still has neither extended its identity nor ventured beyond the military/industrial world. One of those reasons, of course, is the entrenchment of languages such as COBOL in data processing departments. Another is the relatively re-

ABSTRACT

The line tariffs set by telecom authorities around the world are often complex and always confusing for the user. Despite a reduction in many of these tariffs over the last few years, it is only users who understand the complexity that will benefit. That situation will get worse with the introduction of volume-sensitive tariffs for leased lines.

Tariffs Get Tougher



BY CHRIS BUCKLEY

First the good news. During the past two years, there have been reductions in the cost of using most European telecommunications networks. Now the bad news. The increasing complexity of tariff structures has made it harder than ever for users to reap the benefits.

Even so, those price reductions are significant. A sample of tariffs in six major European countries shows that line costs have dropped for most types of networks. Since 1984, for example, the average cost of public switched telephone networks (PSTNs) has fallen by 11%, tariffs for leased circuits have been reduced by 6%, and prices for packet switched data networks have dropped by 10%. The one type of network that has not benefited from these changes is the circuit switched data network (CSDN), where the average cost has risen by 4% over the past two years.

On the face of it, that's a happy picture. These tariff reductions reflect a trend that is both realistic and likely to continue over the next few years. Within that overall trend, however, lie many detailed changes to rates for particular facilities, distances, times of day, or locations. The effect upon individual customers is that future costs become increasingly unpredictable because their best laid plans can be easily upset by the continual shifts in tariff structures. The result is that many organizations will never achieve anything like these levels of savings in their line costs.

One reason is that such average figures are fine for the theoretically average company but bear little resemblance to the real world. In practice, companies able to spot the opportunities will gain much more, either in the form of cost reductions or in better facilities. But companies without the knowledge and expertise to manage their telecommunications will be much worse off.

A recent study in the U.K. shows the extent of the problem. When British Telecom announced new tariffs, the line costs for two firms, both needing intracompany voice and data communications, were analyzed by a consultant. The results showed that PSTN charges for one company increased by over 16%, while for the other company those charges were reduced by almost the same amount. Furthermore, private network line rentals for both companies rose, but by over 8% for one and less than 2% for the other.

The reason for these differences lies in the detail of the tariff changes. Because the tariff changes involved different time allowances, distance rates, and special reductions on some high-traffic routes, the effect upon each company depended heavily upon its own traffic requirements.

This kind of complexity has become a strong feature of all European carrier tariffs. The consequences for users are simple: they can choose the cheapest and/or best option only if they know what it is. It is worth spending the time finding out.

FIGURE 1 **Europe's Tariff Trends**

(1984 Average = 100*)

COUNTRY	PSTN 1984	PSTN 1986	LEASES 1984	LEASES 1986	PSDN 1984	PSDN 1986	CSDN 1984	CSDN 1986
France	79	79	89	106	46	49	51	53
West Germany	143	125	200	145	81	84	171	186
Italy	114	89	69	89	-	68	-	-
Spain	119	108	172	161	268	244	-	-
Sweden	44	38	36	30	52	46	78	72
U.K.	101	95	33	34	53	48	-	-
Averages	100	89	100	94	100	90	100	104

*Each figure in the table is based upon a package of key facilities for the network and adjusted to take account of national inflation rates.

Source: Pactel

Beware the Carriers' Trap

One trap that users should be aware of is the way carriers plan for future demands, and develop their networks and tariffs accordingly. When the telecom authority puts its network in place, the pressure is on to fill the extra capacity with revenue-earning traffic. The long time scales involved in developing telecommunications networks make the capacity filling role of tariffs a very important device. Hence, the user can find itself in the sad position of moving to a new service in its early days, when it is cheap, then being faced with subsequent large increases in charges as the chosen network grows.

A comparison between different PSDNs in Europe illustrates this point. Tariffs for the very successful French PSDN Transpac have matched inflation over the past two years, whereas the networks in Sweden and the U.K., which are not yet as successful, both show tariff reductions over the same period (see Figure 1).

For most users, the bulk of telecommunications expenditure on carrier networks goes on voice, and this will continue for many years. Even with data traffic growing rapidly, advanced multiplexing increases channel efficiency, and so helps to keep costs down. Similar developments can happen for voice traffic only if compaction techniques become widespread on carrier switched networks. Without competition (still the case in most countries), the carriers do not need to hurry this development and can protect their revenue.

Most carriers, even without the spur of competition, recognize the need to reflect in their tariffs the introduction of more efficient transmission techniques. That is especially true for data services where users are able to pack more and more traffic onto leased lines, using better and better multiplexors. That means smaller and smaller revenues for the carrier. Not a good business strategy.

The solution for the carriers is to charge in proportion to bandwidth, or more correctly in a digital era, in proportion to bit rate. Unfortunately for the user, the carrier cannot know how much of the available bit rate on, for example, a leased circuit is actually carrying information. By using advanced modems and efficient protocols, one user might well get five or 10 times as much actual information through a channel as another, less efficient user. The carrier is likely to assume that all users are efficient, since that way it doesn't let any revenue slip away.

The West German PTT has led the way on volume-related tariffs for leased circuits with a phased program stretching into the 1990s. The method of implementation is centered on thresholds of usage volume. In the early stages, the threshold is set high, so that few users will have sufficient volume of traffic to exceed the threshold. Consequently, their leased circuit charge will be the same each month. Beginning this year, however, the threshold volume will be reduced annually, so that more and more circuits attract volume-related charges. By the early 1990s, West German users of most data circuits will be paying costs related directly to volume.

PLANNED ISDN TARIFFS APPEAR TO RELATE MORE TO EQUIPMENT AND LINE COSTS THAN MARKET NEED.

Some carriers will follow policies similar to the West German PTT's. France, for instance, has already announced its intention to introduce volume tariffs over the next few years. Other carriers, meanwhile, will achieve the same objectives by implementing other tariff policies:

- making leased circuits more expensive in comparison to public switched services in order to discourage the development of more private networks;
- offering telecom facilities management services;
- allowing, encouraging, or providing value-added network (VAN) services.

Private Nets Will Increase

Yet, the carriers have a problem here. There is no real possibility of carrier services becoming as advanced as those offered by the private networks of the most communications minded organizations. The capital and skills required are in short supply, and continual development is the norm. In consequence, it is likely that the number and size of private networks will nevertheless increase, rather than decrease, as more companies discover the commercial benefits of well-tuned facilities. Similar considerations apply to facilities management contracts. These are likely to be suitable only for organizations too small to retain their own telecommunications skills.

VANs offer a better future to both user and carrier. By offering more than a basic transport facility, the carrier can raise his revenues, develop and use his technical strengths, and provide higher-quality services. Because each VAN can be a separate business venture, it can develop fast and be responsive to innovative ideas. Competition is natural for such services. The user gets better choices—and more of them—so the company can choose the most appropriate and most cost-effective solution.

In many industries, such as travel and retailing, VANs are already widespread. The pattern that is emerging is for the pioneer user of the VAN to gain a major business advantage, and for competitors to be forced into following as fast as they are able.

For many applications, users are able to negotiate a fixed rate per site for the use of a VAN service, thus insulating them from unpleasant tariff surprises. Although similar to facilities management at first sight, there is a key difference. With a VAN, the user is buying a particular business service, rather than a general contract for telecommunications facilities. It can therefore assess its value in strict business terms.

These kinds of carrier services are expected to become much more common when the Integrated Services Digital Network (ISDN) technology is introduced in most countries over the next few years. ISDN offers the user one-stop shopping for telecommunications by providing integrated access to a range of different services. This has obvious benefits for the user, in the form of simpler interfaces and access to a greater range of services.

Users will expect, however, to pay less for ISDN than they do currently with multiple interfaces and links. It is not yet clear that carriers recognize this simple fact. A user requiring precisely the same capacity as that offered by standard multiple-channel ISDNs will be rare. Most potential users will want combinations of channel types that do not fit easily into the standard interfaces.

The new tariffs must reflect the consequent inefficiency of ISDN access links. The most likely success route for carriers is to offer a tariff structure that allows the user to pay in proportion to the capacity it uses, rather than the capacity provided. In other words, volume tariffing. Apart from West Germany, though, current tariffs planned for ISDN appear to relate more to equipment and line costs, and perhaps to maximum capacity offered, than to the market need.

BILLY'S BIKE
BLINKY the STOP LIGHT
The Humpback WHALE
LIFE in the CITY
The Secret FOREST
Four Fish
CHILDREN'S BOOK EDITOR
Nick Downes

"This is a bad story. This is a bad, BAD, story! Please take this bad, bad story and go far, far, FAR away!"

Cartoon by Nick Downes

But ISDN is still some years away for most users. In the meantime, they will have to cope with complex and changing tariff structures in each country. Figure 1 shows a number of these national trends. In France, for example, there have been above-average increases in all except the PSTN, while in West Germany, the PSTN, leased lines, and CSDN are very expensive in spite of recent reductions. In the U.K., there has been a reduction in the costs of the PSTN and PSDN, but little overall change in leased lines.

IN INDUSTRIES SUCH AS TRAVEL AND RETAILING, VANS ARE ALREADY WIDESPREAD.

Generally speaking, there is no consistent pattern. Instead, these changes show that there are different policies at work in different countries, reflecting the very different aims of the carriers. For example, the rise in lease rates in Italy will help the developing PSDN to attract traffic. The high rates in Spain will undoubtedly decline as the PTT network is expanded in the next few years. In Sweden, the developing PSDN will attract some traffic from the well-established CSDN, but not at a rate that will cause a sudden surge in demand. In France, the lack of PSTN reductions will finance further investment in new technology.

This pattern of local difference between countries can be expected to continue into the foreseeable future. For the user, it makes planning difficult and risky. But for users prepared to put in the effort, it also offers the chance to select the attractive options and use them to advantage. ■

Chris Buckley is a telecommunications specialist based in London. He is in charge of the Telecommunications Networking Group of U.K. consultancy Pactel.

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DATAMATION

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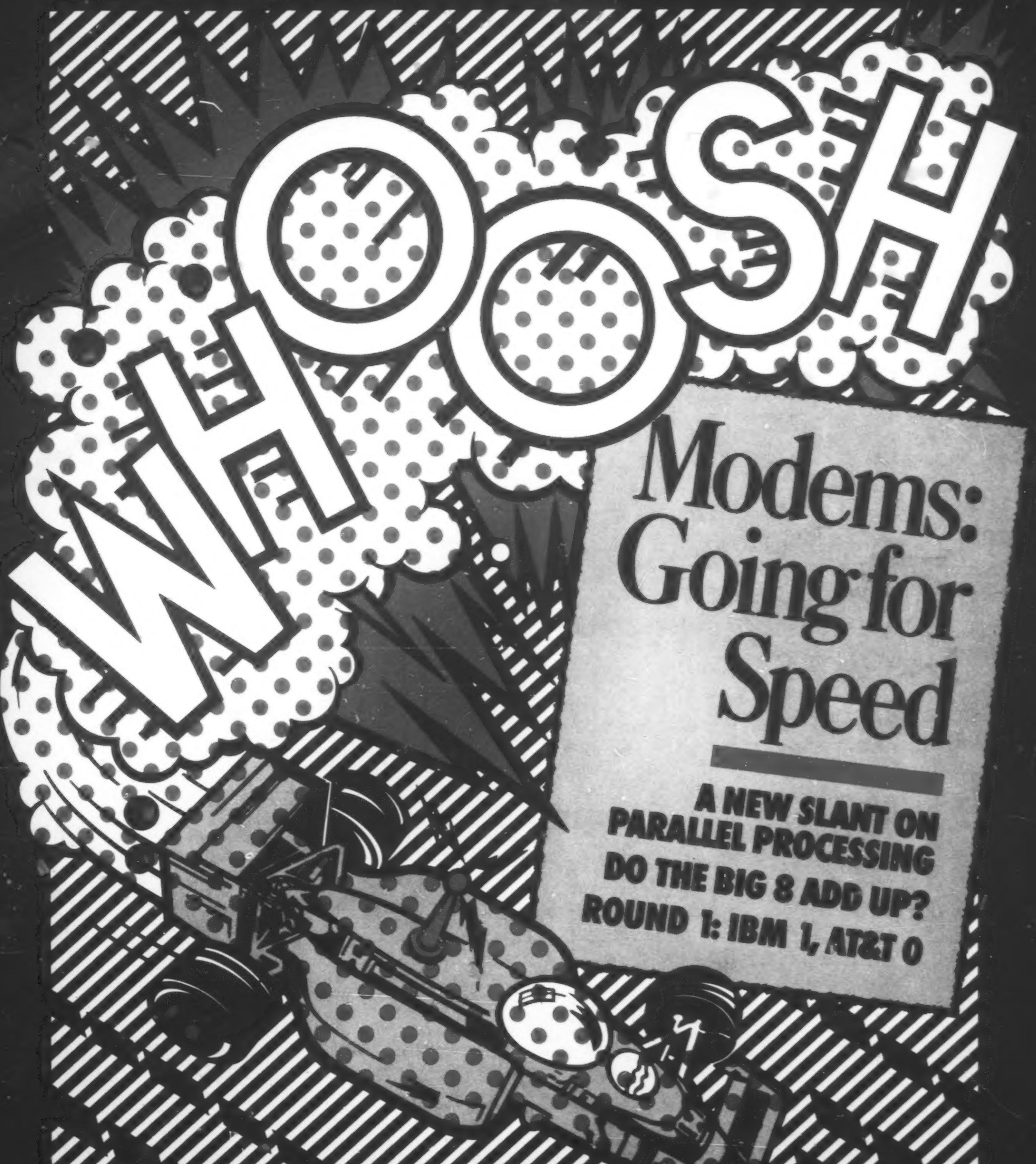

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DO THE BIG 8 ADD UP?

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The business of delivering electronic publishing systems is catching on like wildfire.

COVER ILLUSTRATION BY
DOUG TAYLOR

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Editorial

All the Wrong Choices?

AT&T says it is not getting out of the computer business. But many in MIS still don't know AT&T's in that business.

More than three years after deregulation, AT&T is still thought of by most as "the telephone company." AT&T still holds its own as the dominant long distance communications supplier, but can it go the long distance toward becoming a vendor of integrated computer/communications offerings? (see "Round One: IBM 1, AT&T 0," p. 37).

We asked that question of 22 members of the DATAMATION Executive Panel, comprised of MIS executives in Fortune 1000 companies. As managing editor Parker Hodges reports on p. 38, most have no experience with AT&T as a computer supplier. Only three of the 22 MIS execs knew of any AT&T micros or minis in use in their corporations. The most positive response we got to the question of how MIS evaluates AT&T's minicomputers was that they are "better than IBM's, worse than Digital Equipment Corp.'s." Most say they have no idea, no experience on which to base judgment—and no plans to find out.

AT&T had more promise than most companies for huge success in the computer business: its very foundations are in electronics. Bell Labs, founded in 1925, is responsible for many of the most important technological developments in electronics today—the transistor, the laser, and the solar cell, to name a few.

But it's a long road from the labs to the hearts and minds of MIS.

Three years ago, we were looking at AT&T as IBM's soon-to-be rival. Now, in 1987, we see AT&T dismissing up to 40,000 employees, its data systems operations losing big money, and its hoped-for savior, Unix, promising much but delivering less than had been wished for (see "Barking Up the Wrong Tree," p. 22). After going outside—the company and the country—for computers to market, AT&T recently brought in an Olivetti executive to run its computer business.

Where will we find AT&T three years from now? Who knows—maybe it will be a subsidiary of Olivetti. Funny? I'll bet Carlo de Benedetti won't laugh at that one. . . .

Rebecca S. Barna

REBECCA S. BARNA
EDITOR

To claim a share of the electronic publishing market, vars must move fast. The hottest area in desktop publishing is for systems that run on IBM-like hardware and do what can be done on the Apple desktop publishing system. To sustain a high rate of return in this market over the long term, vars should focus on the more complex or multiuser applications. WYSIWYG "is almost passé. The next level is to integrate WYSIWYG with CAD/CAM." The migration of electronic publishing will be from the engineering and technical departments into the rest of the corporation.

Let the Presses Roll

BY ANN LALLANDE

The business of delivering electronic publishing systems, says Russ Pond, sales director for a MicroAge Computer store in Norfolk, Va., "is catching on like wildfire."

The advent of the laser printer, graphics-oriented microcomputers, and all manner of clever inventions has turned publishing into an electronic art form and improved the visual quality of business documents exponentially. Suddenly, the medium is an integral part of the message, and everyone corporate wants to write in proper font and point.

A $503 million industry in 1985, the electronic publishing market—not including output devices—will top $4 billion in 1990, predicts CAP International Inc., Marshfield, Mass. Less conservative estimates figure that annual sales for the entire market will ring up to $7 billion by the end of the decade.

FOR RESELLERS, THE BIG YEAR IS 1987.

Electronic publishing, enthuses Tim Bajarin, a vice president at Creative Strategies Research International in San Jose, "is probably the most significant market for value-added resellers since the introduction of the personal computer." It provides one of the few opportunities, he says, "for vars to develop and sell a complete systems solution in the way minicomputers and custom software were sold 10 years ago."

Naturally, vars are not the only contenders for the electronic publishing jackpot. Nevertheless, by the end of the decade, according to International Data Corp. (IDC), Framingham, Mass., they can expect to move 5% of the low-end, desktop publishing software packages, 12% of the midrange systems, and 15% of the high-end solutions. That could add up to nearly $500 million in sales in 1990.

To claim a share of the revenues, however, vars must move fast. "The market is maturing so quickly," explains Bajarin, "that from the standpoint of the var, the big year is really 1987. By 1989, the system solution will not need as much support."

This could prove especially true at the low end of the market. The entry-level electronic publishing market is defined generally by microcomputer-based desktop publishing (DTP) systems, while the market's midrange and high-range solutions are built around workstations and mainframes.

Though desktop publishing has its roots in an application for individuals, publishing is often a group process. Consequently, predicts Arlene E. Karsh, director of computer publishing systems at CAP International, as personal computers become more powerful and as the operating and software systems begin to accommodate networking, "you will see further generations of desktop publishing address the work group." DTP, concludes Karsh, "is a moving target."

At the low end, desktop publishing systems fall into two camps: Macintosh systems (see "Apple's Life Saver") and IBM or IBM-compatible systems. Currently, this is a very viable var market because "these are not simple programs," says Meg B. Wingard, marketing representative for Northshore Publishing Systems, a Seattle reseller. "The manuals are not as precise as they should be, and a fair amount of hands-on training is needed for someone to get up to speed rapidly." This is true of the Macintosh even though it is user friendly, specifically designed for graphics, and systems oriented.

Any complexity faced by Macintosh users, however, pales when compared to the challenges encountered by owners of the IBM PC, its upgrades, and its look-alikes. Just to get the IBM PC to act more like the Macintosh, says MicroAge's Pond, an admitted Mac enthusiast, users need to buy a special mouse unit, a hard-disk drive, an enhanced graphics card, and an enhanced color display.

In addition, dozens of software companies are developing publishing packages they promise will work on the IBM PC. Many do not, at least not straight off the shelf, says Ajit Kapoor, director of electronic publishing services at Dataquest Inc., San Jose. Each needs some customization.

An Erector Set Universe

The IBM PC publishing market, concludes Woodrow H. Vandever, executive vice president of InterConsult Inc., Cambridge, Mass., "is an erector set universe." From a var's perspective, that is a dream come true. Not surprisingly then, "the theme of the year and the hottest area in desktop publishing is systems that run on IBM-like hardware and do what you can do on the Apple desktop publishing system," says CAP International's Karsh. At Comdex/Fall last November, for example, AST Research Inc., Irvine, Calif., and Cordata Technology Inc., Thousand Oaks, Calif., introduced complete DTP systems built around IBM PC compatibles.

Vars are convinced that as solutions become available for the IBM environment, sales will increase significantly. Currently, Computer Realization Inc., a Salt Lake City var, pulls in one third of its revenues from desktop publishing. Most of this income has been realized from the sale of Macintosh systems, but now the company will go back to its installed base of IBM users or users of IBM look-alike equipment, who have been waiting for an IBM solution.

Despite Computer Realization's success in desktop publishing and the high volume of DTP sales in general, president Margaret S. Hunter takes a dim view of the market's future margins. This, she declares, "is a short-term market of one to two years." Hunter is certain that desktop publishing will go the way of word processing: "Everyone will be doing it, and you will be able to go into your local Businessland and pick it up."

FIGURE 1 **Electronic Publishing Market: 1985-1990**

YEAR	TOTAL ELECTRONIC PUBLISHING MARKET*	HOST-BASED SOLUTIONS (MINI OR MAINFRAME)	NETWORKED WORKSTATIONS	PC-BASED PUBLISHING SYSTEMS
1985	$503 million	$302 million	$146 million	$55 million
1990	$4.03 billion	$1.57 billion	$1.53 billion	$929 million

*Not including output devices

Source: CAP International Inc., 1986

FIGURE 2 **U.S. In-House Publishing Market: 1985-1990**

Percentage of Packaged Software and Systems by Distribution Channel

SEGMENT	DIRECT SALES	DISTRIB-UTORS	OFFICE DEALERS	RETAIL	VARS	TOTAL
DESKTOP SOFTWARE PACKAGES						
1985	60.0	20.0	2.5	15.0	2.5	100.0
1990	35.0	25.0	10.0	25.0	5.0	100.0
MIDRANGE SYSTEMS						
1985	80.0	17.0	2.0	1.0	—	100.0
1990	50.0	30.0	5.0	3.0	12.0	100.0
HIGH-END SYSTEMS						
1985	90.0	10.0	—	—	—	100.0
1990	63.0	20.0	2.0	—	15.0	100.0

Source: International Data Corp., 1986

To sustain a high rate of return over the long term in the electronic publishing market, then, vars should focus on the more complex or multiuser applications, whatever hardware solutions they may entail. Viewed as a horizontal market, with most companies scrambling to meet administrative, graphic, and technical publishing needs, electronic publishing offers a myriad of specialties and subspecialties for vars to exploit.

The fact that publishing applies across departmental lines will not only be good for business, "it will have a big impact on how vars do business," says Clark Hills, senior marketing manager for computer aided publishing at Apollo Computer Inc., Chelmsford, Mass. "Vars can no longer just come out with point products and try to automate a specific piece of the publishing application. They are absolutely forced to coexist in other environments."

In technical publishing, for example, manufacturers are beginning to connect computerized design programs with documentation processing programs because the documentation of technologically advanced products may consume anywhere from 10% to 30% of the design process and new products cannot be released until their documentation is completed. Within this context, the trend in electronic publishing solutions to provide users with a "what you see is what you get" (WYSIWYG) picture on their monitors "is almost passé," observes Hills. The next level, he says, "is to integrate WYSIWYG with CAD/CAM."

To achieve this degree of integration, though, CAD vars have to cooperate with the technical illustrating vars, who have to work with technical composition vars, and so on down the line. The point of the exercise, explains Hills, "is to improve the productivity of the work group, not just of the individual."

Requirements Will Vary

Of course, requirements will vary from one corporate publishing group to another. A technical publishing system has to be strong on computer-generated graphics and able to handle long documents. Interleaf Inc., Cambridge, Mass., has targeted this market—some say created it—with its technical publishing software (TPS), which runs on IBM, Apollo, Sun, and Digital workstations. Interleaf's typical TPS customer dedicates its system to an in-house publishing function and uses it 100% of the time to produce documents of 100 pages or more.

The company's main focus within technical publishing is manufacturing, and its clients include General Motors, Alcoa, Alliant Computers, and McDonnell Douglas Aerospace. "Manufacturers are under a lot of pressure to enhance their productivity," says Leslie J. Anderson, a marketing manager at Interleaf. "They have trimmed existing fat, made plants energy efficient, and automated to some extent. This is one of the last gray areas that people didn't want to deal with."

Nevertheless, firms began to take a look at the numbers, and the news was not good. InterConsult estimates that corporate expenditures on printing and publishing services consume between 6% and 10% of gross revenues. Then, however, companies discovered that electronic publishing could reduce these outlays from 25% to as much as 60%, while giving them control of their documents and reducing their reliance on outside vendors. That, says Anderson, "was when manufacturing jumped right on it."

RG Engineering, Rochester, N.Y., has watched firsthand as computer aided design moved into the electronic publishing arena. RG, which has operated as a VAR in the PC-based CAD market, is now offering a variety of hardware and software solutions for the publishing market. The reseller features Xerox's Ventura publisher and IBM's AT and RT. Says president Robert A. Giese, "We feel that the migration of electronic publishing will be from the engineering and the technical departments into the rest of the corporation."

One destination is administration and office management. Tools for this environment, says CAP's Karsh, will probably look like word processors. Then, depending on a firm's line of business, system capability might handle and manipulate large databases, generate preformatted forms, and process text, statistics, and graphics generated by other departments.

There is much talk about how word processing will become a subset of electronic publishing, or vice versa. Alan P.

Apple's Life Saver

You remember, it was Apple Computer Inc. that brought us the personal computer market. IBM, noticing that Apple was onto something good, then dove in and nearly swamped its rival. Since then, Apple has had its ups and downs, and at times some people have wondered whether it would sink or swim. Of course, all that was before Apple virtually created the desktop publishing market around its Macintosh computer.

With that initiative, the company seems to have found its stroke again, and desktop publishing (DTP), says Russ Pond, sales director for a MicroAge computer store in Norfolk, Va., "is driving it into those areas that it previously had been held out of, diffusing the MS/DOS barrier that existed in the past."

Pond's store, for one, is having a great deal of success integrating the Macintosh into the IBM environment—AKA corporate America. Before DTP made a big splash, the Macintosh did not see the inside of very many companies, reports Pond. "Now, it's getting into big-time business."

Presumably, this has contributed to the Mac's recent success. In retail sales—as opposed to direct sales, where IBM still dominates—the Macintosh has been the country's number one selling computer. The Mac has managed to capture 90% of the desktop publishing market among small newspapers and it has cornered 75% of the entire market, according to Dorman Associates Inc., Marshfield, Mass.

In the desktop publishing market, the PC—as in IBM PC and its clones—"is still getting its butt kicked by the Macintosh." So says Jim L. Lucas, vice president of sales at American Business Machines, a value-added distributor based in Nashville.

But not for long, according to Lucas. Though he has only just jumped into the DTP market, Lucas is so confident of IBM's ability to recover that he is taking the plunge with the IBM PC. "By late spring, early summer," predicts Lucas, "the PC desktop publishing market will start to take hold."

And Lucas is not the only reseller who thinks this way. Computer Realization Inc., a value-added reseller located in Salt Lake City, used to sell the Macintosh until Apple took its business elsewhere. According to president Margaret S. Hunter, however, it was just a matter of time before her company would have stopped carrying the Mac.

Computer Realization's desktop publishing sales with the Macintosh accounted for about 33% of its revenues, or $33,000 a month. With an IBM solution, though, Hunter expects to realize two to three times that. "We've stayed in touch with our [installed base]," she says, "and they've been very patient about waiting for the IBM product."

Apple remains unconcerned about such talk. John M. Scull, marketing manager for desktop publishing, acknowledges that Macintosh's DTP system has served as an entrée into the corporate world, but he insists that it is by no means the Mac's only ticket into the office.

According to Scull, the high visibility enjoyed by the desktop publishing door-opener is due more to Apple's dominance of that market than anything else. He is quick to point out that "if you look at some of the other products available on the Macintosh, often times you'll see it's the Excel spreadsheet, the Double Helix, or Omnis Three database applications, Microsoft Word, and several project management products that are getting us into that key department within a company."

Nevertheless, some analysts seem to think that the impact of desktop publishing on Apple's business sales cannot be underestimated. "It has been the most effective backdoor approach to getting recognized by corporate America," declares Tim Bajarin, a vice president at Creative Strategies Research International in San Jose. The problem that Apple has, he goes on to explain, "is that it tends to be the evangelist. It does its homework, educates the market, preps it, and gives it the initial solution, while IBM sits back, twiddles its thumbs, and then goes to school on Apple."

In other words, the pattern appears to be repeating itself. Just as Apple thinks it is safe to go back into the water, IBM is beginning to circle. Perhaps this time around, Apple has made sufficient capital on its head start to outswim Big Blue's grasp.

Hald, chairman of MicroAge Computer Stores Inc., headquartered in Tempe, Ariz., envisions the two applications combined into what he calls a document management system. Hald prefers to decide for himself—rather than abdicate the control to his graphics department—where the visuals of a document should be positioned relative to the text and what format the text should ultimately take. Electronic publishing, he says, "is a very, very powerful tool for people who feel it's important to communicate information in the proper context."

This view, says Creative Strategies' Bajarin, is shared by a good many executives. "Most businesses are not interested in publishing per se," he insists. "What the word processing market is looking for and demanding is a product that allows it to control page layout."

Ashton-Tate Co., Culver City, Calif., is poised to address the office market, notes one analyst, "with a product designed to help the general pc user and word processor control his page and make it look elegant." He predicts the package "will be the most powerful product for the office and it will allow the word processor to become a typography-rich tool."

Corporate graphic arts departments, by contrast, are publishing oriented. In fact, they may service all the publishing needs of a company. Consequently, their publishing solutions require a great deal more sophistication and flexibility in font selection; in the graphics they can generate or reproduce, including presentation graphics; in input and output devices; and in document length and volume.

Graphics a Segment of Vertical Market

Actually, graphic arts departments represent one segment of the vertical market in electronic publishing—those companies earning their livings in the traditional publishing, printing, and graphics industries. This is the market Apple encourages its vars to pursue.

Apple believes its dealers can handle the more generalized publishing applications, while the prepress typesetter market, print shop operations, newspaper systems, and large corporate publishers require the depth of expertise and specialization that only a var can provide.

Still, the vertical market has its drawbacks. Because it is absorbing the technology so rapidly, says MicroAge's Pond, sales for entire system solutions are likely to peak quickly. A healthy aftermarket will fill the void, but that is an incremental business. As a result, vars are adopting something of a cross-cultural tack in the sale of electronic publishing systems. For example, MicroAge in Norfolk, Va., earns 50% of its revenues from electronic publishing sales, and is marketing DTP systems to television stations, architects, law firms, and aerospace companies, to name a few.

To expand the capabilities of the systems it installs, the store, which Pond describes as a full-service, value-added dealer, has established an experimental network to provide customers with the option of high-quality output on a typesetter. If all goes well, Pond hopes the network eventually will allow users to exchange graphic information.

Despite the widespread enthusiasm for electronic publishing, the systems are not exactly selling themselves. Shelley Bakst, a senior analyst at IDC, notes that short product cycles are raising concern about obsolescence; would-be users are not sure whether to plunge in and buy a system now or to wait.

At the high end of the market, customers are worried about the effectiveness of training programs, since not everyone is a graphics artist. Finally, companies are anxious about the lag in the development of industry standards. They are jittery about whether publishing solutions will integrate well with other in-house systems, or if they will become isolated clusters incapable of communicating with anything else inside or outside their companies.

This, of course, is the stuff on which vars thrive. A key factor in the success of a sale, however, is whom you talk to. While many vars are approaching companies on a departmental basis, Interleaf's Anderson recommends going to the MIS staff. MIS departments are increasingly getting involved in the buy decisions for electronic publishing systems, she says, and that is all to the greater good of both vendors and buyers. Although the selling cycle may stretch out while MIS tries to secure a standard that will work throughout the company, ultimately an order may be significantly larger because the MIS manager may recommend electronic publishing to several other departments within the corporation.

A var's perseverance will then pay off handsomely. Electronic publishing, promises Computer Realization's Hunter, "is a very lucrative, high-margin business." ■

Ann Lallande is a freelance writer based in Alexandria, Va.

VICE-PRESIDENT! (THE EMPHASIS IS MINE)

Cartoon by Eli Stein

C1850-5
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EXCLUSIVE

DATELINE MOSCOW:

The USSR's Dp Chief Talks

DATAMAT

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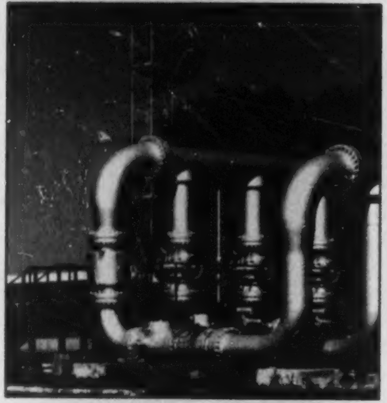

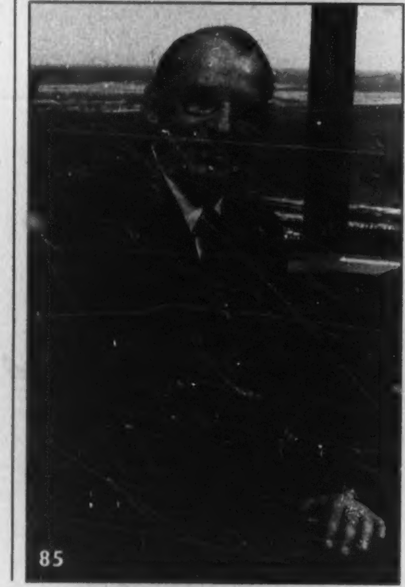

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Users have an insatiable appetite for memory, and the cost of providing it is dropping dramatically.

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Peter Angelo Simon

OEM EDITION

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Editorial

Time for a Second Move

It was almost two years ago when we first requested an interview on Soviet soil with the dp chief of the USSR. It was little more than two months ago that our interview was approved. When international editor Paul Tate arrived in Moscow on Jan. 19, it was during the Soviets' coldest winter of the century.

But his reception was warm. He left London hoping to get a reasonable answer to his toughest question: how do you introduce mass computerization into a closed society? He returned with an answer: the Soviet Union is not as closed as it once was. That's a start. What's more, he met with a man who seems more scientist than politician.

It's easier to oppose an ideology than it is to oppose a person.

The granting of our interview can only be seen as one more step in a series signaling the start of openness in Soviet society. Soviet leader Mikhail S. Gorbachev's latest moves toward a greater "democratization" are long overdue. For the once-censored "Doctor Zhivago" to be serialized by the Soviets next year somehow makes more sense than ABC's recent airing of the mini-series "Amerika."

We applaud the Soviets' respect for DATAMATION. Their government made it clear that it expected no less than fair and equitable treatment of its views on East-West trade in computers. Fair and equitable is our story, "Opening Moves" (p. 43).

But in the interest of fairness, we must now make a "second move" as a magazine. We must state our position on the eastward flow of technology. Our original question has grown: now we ask, can computers help open a closed society? Our answer is, yes; let's sell the Soviets personal computers. The use of pcs serves to accelerate an open society. They foster individual freedoms, not government control. We can help speed the democratization of the East without mortgaging the future of the West.

But trade beyond pcs is a subject for debate by those well versed in computers as well as national security. Computers, after all, are at the core of every government's defense strategy.

And Boris Nikolaevich Naumov, after all, is only part scientist. ■

REBECCA S. BARNA
EDITOR

Storage quantities once limited to mainframe environments are now common for micros and supermicros. Optical storage makes new market opportunities for vars and oems. But magnetic media, particularly Winchester technology, still boast the money-making characteristics of speed, reliability, updatability, and price; floppy disks and tape drives will feel the brunt of the optical attack.

Mass Storage Opportunities

BY ANNE A. ARMSTRONG

There's a small boom in market research: reports abound on the mass storage market. Without exception, researchers agree on two things: that users have what seems to be an insatiable appetite for memory; and that the costs of providing this memory are going down dramatically.

Disk/Trend Inc. of Los Altos, Calif., has recently completed its analysis of the rigid disk drive market and concludes that worldwide revenues reached $15 billion in 1986. The biggest growth area in fixed drives is expected to be in the 30-megabyte to 100-megabyte range.

Worldwide shipments of these drives is forecast to hit 1,793,500 by the end of 1986, an increase of more than 115%. Nearly 95% are 5¼-inch drives. In the next five years, Disk/Trend expects 3½-inch drives to take over the low-capacity market (less than 30MB) and to capture more than 90% of the total.

"NOT REALLY SOLD ON OPTICAL STORAGE."

Electronic Trend Publications of Cupertino, Calif., released a lengthy study in 1985 on the impact of optical memory on magnetic storage. Among its conclusions are that growth in the optical disk drive market will double each year for the next three years.

Although all types of magnetic storage will feel the impact of optical memory systems, according to ETP, Winchester disk storage will be the least affected (see Figure 1). The greatest impact will be on the market share held by floppy disk drives and tape drives, says Jonah McLeod, author of the report.

Santa Barbara, Calif.-based Freeman Associates, which also analyzes the optical disk market, sees read-only drives selling the most units, but more expensive write-once drives pulling in the biggest percentage of revenue. Erasable optical drives are expected to edge into the market at the end of 1987 and to grow to represent worldwide sales of more than $347 million by 1991.

What all these numbers and predictions mean for vars is a continued healthy growth in memory sales and at least some erosion of magnetic media sales to optical technology.

The dramatically falling cost of all kinds of storage has presented a host of new options for resellers and users alike. Storage quantities once available only in mainframe environments are now becoming common in the micro and supermicro environments.

Another market research firm, InfoCorp., also of Cupertino, says standard hard disk configurations in personal computers increased to 20MB in 1986 from 10MB in 1984, and are expected to grow to 40MB by 1988. John Gale of the Information Workstation Group in Alexandria, Va., says current user demands require at least 20MB of hard disk storage and AT performance. "The 10MB disk is passé," he comments. "You can't do anything with it."

But the industry is already exceeding these expectations. Priam's systems division has just announced that it has signed an agreement with Entré Computer stores to sell two of its hard disk systems for the IBM aftermarket. The sizes of the drives are 60MB and 62MB. A Priam Corp. representative says the San Jose company believes that the market is already demanding more than a 20MB or

30MB capacity. Several analysts agree that the market may skip 40MB and move quickly to a 60MB standard hard disk configuration.

Two factors have been driving the storage market—the declining cost per megabyte of memory and the growing demand for storage made by applications programs, such as electronic publishing systems and CAD/CAM.

David Vellante, storage products program manager at International Data Corp. in Framingham, Mass., says that vars need to go beyond the storage supplied by the computer vendor for two reasons: target applications frequently require faster, higher capacity drives; and profits can be enchanced by dealing directly with drive manufacturers.

Reviewing var activity throughout the country, Vellante sees four "hot" mass storage application areas that are currently fueling much var interest—CAD/CAM, communications networks, electronic publishing, and database-intensive applications.

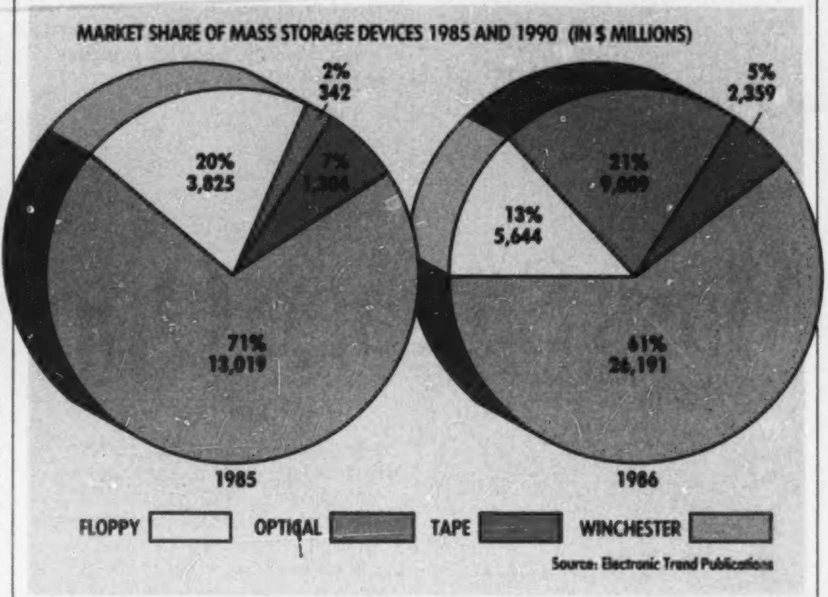
Selection Depends on Application

Selecting a particular type of storage depends, of course, on the specific application. Vars tend to offer custom arrangements, not cookie-cutter conformity. A look at the choices some vars and systems integrators are making, however, may offer some useful information to other vars facing similar decisions.

Fixed disk drives, particularly Winchesters, remain the choice of a number of the vars DATAMATION talked to. The most frequently mentioned advantages were speed, reliability, updatability, and price. Rich Pounds, vp of DataChange Inc., a software developer and var in Norcross, Ga., says, "We're not really sold on optical storage. Right now, I don't see any major applications. Access times are too slow, and in many cases, there is no full-text search capability. You have to know what you're looking for before you can locate it on the disk."

"CUSTOMERS JUST WANT SOLUTIONS."

FIGURE 1 **Optical Memory Impact on Magnetic Storage**



Source: Electronic Trend Publications

Pounds says most customers with database-intensive applications can get two large-capacity Priam hard disk drives for $28,000 and run a 16-terminal pc system off of it for less than the cost of a large optical system. "You can reindex and update everyday on a system like that," he says. According to Pounds, the acronym WORM doesn't stand for "write once, read many times"; he believes it can mean "write once, read maybe."

Cambridge, Mass.-based Interleaf Inc., which designs and markets turnkey systems and software for computer aided publishing applications, also selected Winchester technology for storing the systems programs that scan, edit, and manipulate text and images. The basic Interleaf workstation includes a Sun, Apollo, DEC, or IBM workstation and 86MB of hard disk storage, tape backup, and a laser printer.

In desktop publishing and CAD/CAM applications, 86MB is evolving as the minimum storage standard for more complex systems, according to International Data Corp.'s Vellante. Even with the 80-plus megabytes in Interleaf's system, says a company executive, the program contains so much code that only 20MB of the hard disk are free for user data storage.

When access time is critical—as it is in real-time image processing, for a file server on a busy network, or in an automatic equipment testing environment—vars may want to consider specially designed, high-end Winchester drives, such as Chatsworth, Calif.-headquartered Alpha Data's Atlas series of hard disk drives.

All Atlas drives use multiple heads. In the case of the 520MB model, 76 heads move over four disk platters at access times the company says are less than 18msec. Other models offer 128MB and 160MB configurations with 54 heads. At an oem price of $6,000 to $9,000 a drive, the Atlas is targeted at high-end office applications, local area networks, and CAD/CAM workstations.

Reliability is mentioned often as a reason to stick with magnetic media. Customers are comfortable with the technology. With the growing sizes, capacities, and capabilities of Winchesters, the fixed disk drives are evolving to fit new situations and are not being pushed aside by newer technologies.

Optical technology is used for a number of storage products that have little in common except that a laser is used to encode and read the data. Write-once drives in both 12-inch and 5¼-inch sizes have been aimed primarily at the archival market.

A typical configuration is as part of a document filing system that a bank or an insurance company would use to permanently record medical records, bills, receipts, or other transactions. In this application, the nonerasability of the optical disk is considered an advantage. The disk material is nonvolatile—lasting at least 10 years, instead of two or three—and it cannot be erased by accident.

Biggest Drawbacks

The biggest drawback of the large write-once disks has been a lack of standards and high prices. For a document filing system with a jukebox of 12-inch drives, each holding one gigabyte on a side, the retail price can range from $300,000 to nearly $500,000.

The advent of 5¼-inch write-once drives in production quantities means that vars can now consider small optical drives as components in systems they configure.

TAB Products Co. of Palo Alto, better known for its office supply division, has included optical drives in two document filing systems. The 12-inch Series 2500 includes a scanner, Hitachi 12-inch write-once drive, Hitachi jukebox, high-resolution screen, and laser printer. Priced between $60,000 and $100,000 depending on the size of the jukebox, the system is still beyond most reseller markets.

TAB is also showing a smaller system, called the Series 1000, based on Optotech's 5¼-inch write-once drive. The system uses a small scanner, an AT, a small-form optical drive, and a laser printer. The system, complete with database software, retails for $49,900.

Colorado Springs-based Optotech's drive and controller are expected to sell as a separate package for $4,500 in oem quantities. Connected to an AT, the drive offers 200MB of storage in a size and shape that will fit into a desktop system.

LaserData Inc. of Lowell, Mass., is now marketing an electronic filing and publishing system that includes both a small write-once drive and a compact disk read-only memory. The scanned documents are stored on the WORM drive, and if the data require wide distribution, they can be transferred to CD-ROM format and replicated. With scanner, IBM PC, software, and laser printer, the system sells for $39,000.

Erasable optical technology interests many resellers, but the technology has not made it out of the lab. Some working prototypes have been shown in public by Hitachi and others, but industry analysts do not expect the drives to have much impact on the market before 1989 or 1990.

CD-ROM is, of course, an optical technology, but because it is read-only, it has special applications as a publishing or reference tool. Its appeal to the reseller market is that it can be configured inexpensively as part of a larger system. It holds 550MB of digital data—sound, images, or text. Where networking is not a possibility—widely distributed locations, for example—and the data are reasonably stable, CD-ROMs will store volumes of reference material that can be inexpensively accessed.

"Okay, so, like, if I got this, ya know, receptionist job, would I, like, be expected to, ya know, like, speak English?"

Vertical Markets Early Choice

Vertical markets have been an early choice for many CD-ROM products. High-end financial information products have either been introduced or announced by Massachusetts companies Datext Inc. of Woburn and Lotus Development Corp. of Cambridge, and by Disclosure Inc. of Bethesda, Md. Subscriptions to such databases on CD-ROM run from $4,000 to nearly $29,000. Medical, legal, and engineering products are either in process or already on the market.

In many cases, the systems are being sold by the information provider as a way to find a new customer or regain control over product that was lost in an on-line environment. But there are still opportunities for vars with knowledge of the information needs of a specific vertical segment to put together a product and distribute it on CD-ROM disk.

Quadram Corp., Norcross, Ga., is developing a system called Quadvision that will allow companies to build image databases and prepare catalogs of text, pictures, stills, or videos. The Quadram system draws on software that has grown out of the interactive videodisk market and is now applied to a system that contains CD-ROMs, videodisks, IBM PC clones, and laser printers.

In these vertical markets, the collection of data is frequently considered valuable enough to justify the cost of the hardware. A PC clone, laser printer, CD-ROM drive, and required search and imaging software from a company such as Reference Technology are now priced at $10,000. Corporate or in-house uses are expected to increase, particularly where the search capability of the disk cuts time lost looking for a part or a "cite" from a manual.

Whatever storage technology is selected, the var must balance the demands of the application against the capability of the system and choose the most cost-effective answer.

"By and large," says DataChange's Rich Pounds, "customers don't care about technology. They just want solutions." ■

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Cartoon by Tim Haggerty

[redacted]

A new survey of programmers and analysts finds that most of them like their jobs, primarily because of the kind of work they are asked to do. Most even like the salaries they are paid. Programmers and analysts who work for dp companies feel their work is appreciated, but outside the field, many think management is hostile, seeing dp as a cost, not a resource.

What You Should Know About Programmers

BY MARJORIE FREEDLAND

Just who *are* the men and women you've trusted to write critically important systems and applications for your company? What do systems analysts and programmers think about their work? What do they think of their bosses? Why do they quit? Are programmers and analysts optimistic about advancement within their firms? About the job market outside?

To find out, DATAMATION and Deutsch, Shea & Evans, a human resources research and advertising firm, conducted a dp career survey. In September 1986, 5,000 names were selected from DATAMATION's national circulation list. The survey targeted systems analysts, programmers, and their immediate managers: supervisors of analysis; senior systems analysts; chief, lead, and senior programmers. Thirty-five percent, or 1,751, responded. The proportion was 70% staffers, 30% supervisors.

[redacted]

"ALL DP PROBLEMS GO THROUGH ME."

The current survey updates and extends a profile of the dp professional that began when DSE surveyed DATAMATION readers in 1978. Wherever applicable, we compared today's findings with those reported eight years ago.

First things first: why did these people opt for their jobs? Multiple answers were permitted, so the total does not equal 100%.

It is encouraging that most took their jobs because they expected to like the work: 42% of the sample say they find their jobs creative, exciting, and above all, professionally challenging. They write about "hot new projects," as well as diversity, i.e., "always something new." They enjoy their autonomy and freedom from supervision, and the scope of their responsibilities—"All dp problems go through me." The nature of the work is more important today than in 1978's survey, when 35% reported it was the reason they had chosen their jobs.

The next biggest factor was salary and benefits, which 36% of the 1986 sample cite as most important, down from 39% in 1978. Significantly, there is noticeably less concern with salary among young, entry-level people, who admitted they just needed a job, and among senior people—55 years or older, or with their company at least 15 years.

Opportunity for advancement was the deciding factor for 28% of the sample, somewhat more so among the younger participants.

Potential for training and education (8%) was more important to the younger and less experienced. Job stability had limited impact (6%), as did the relation of their new position to prior experience or background (2%).

Job location was a key point for 23% of the sample, but the oldest, most tenured, and least experienced are considerably more flexible. Working conditions and environment—things such as flextime—were of top importance for 10%.

Company's Culture, Style Important

For 8%, it was the image of the organization itself—its reputation, corporate culture, management style, and stability—that drew them to their company. Private-sector employers, particularly the Fortune 1000, are highly regarded. Another 3% commended the size and

FIGURE 1 Why They Left

NEGATIVE FACTORS ABOUT PRIOR DP POSITION	
CAREER FACTORS	**%**
Lack of advancement	18
Poor compensation	15
No job security	2
Lack of training/education	1
THE EMPLOYER	
Poor management, organizational politics	9
Restructured, out of business	6
Poor attitude	3
Relocated	2
THE WORK	
Unchallenging, uninteresting	10
Location/relocation	8
Working conditions/ environment	8
Outdated equipment, systems	3
Laid off	2
Other	5
None/did not comment	6
No prior dp employer	30
	*

*Total exceeds 100%, due to multiple response.
Base: Total number of respondents 1,751 = 100%

FIGURE 2 What's Good

MOST SATISFYING ASPECT OF PRESENT POSITION	
THE WORK	**%**
Challenging, autonomous, diversified, scope of responsibilities	67
CAREER FACTORS	
Compensation	5
Training/education	4
Job security	2
Advancement opportunities	1
Client/user contact	8
Working conditions/environment	7
Equipment/systems	6
Caliber of coworkers	5
Management recognition, attitude/support	2
Other	1
Nothing/did not comment	9
	*

*Total exceeds 100%, due to multiple response.
Base: Total number of respondents 1,751 = 100%

scope of the dp operation.

Seven percent wanted to work with equipment, systems, and methods on the "leading edge of technology."

Six percent report that this was their only offer. One confides, "Unemployment doesn't pay very well." In some cases, lack of experience or advanced age present problems: "Entry-level positions are difficult to find," writes one, and an "over 45" writes, "No other employer would consider my application."

Since 70% of the respondents have had at least one other dp job, why did they leave it? As Figure 1 shows, they were frustrated in their careers (36%), disenchanted with their employers (20%), bored with their work (10%), unhappy with the location (8%), working conditions (8%), and equipment and systems (3%). In essence, a replay of the scenario in 1978.

Dissatisfaction with previous employers is intense; it focuses on management, which movers variously describe as ignorant, inept, obnoxious, even tyrannical. Bad enough if bosses were "wishy-washy," worse if they were "half-ass management always yelling and screaming, never doing any long-term building." Job movers deplored the bureaucratic and political atmosphere—in corporations as well as government agencies—that fosters the "buddy systems of promotions.

FIGURE 3 What's Bad

LEAST SATISFYING ASPECT OF PRESENT POSITION	
MANAGEMENT	**%**
	15
THE ORGANIZATION	
Bureaucratic, political, too large	12
CAREER FACTORS	
Lack of advancement	11
Compensation	8
Lack of training/education	3
THE WORK	
Unchallenging, unsatisfying, paperwork, documentation	16
Working conditions/environment, understaffing	12
Lack of recognition	5
Outdated equipment, systems	5
Caliber of coworkers/users	4
Budget limitations	2
Limited authority	1
Location	1
Nothing/did not comment	17
	*

*Total exceeds 100%, due to multiple response.
Base: Total number of respondents 1,751 = 100%

Long hours, having to work weekends, and hectic schedules inspired defections. Dress codes and specified times for coffee breaks and lunch hours also sent programmers looking for the exits. Some left because they were tired of working with obsolete equipment or technology.

People seem happier with their present jobs. As Figure 2 indicates, two thirds (67%) report—as they had anticipated—it's the work itself that most turns them on. This percentage is virtually unchanged from 1978.

What's the flip side of the coin? What bugs them most about their current jobs?

Management Problems Bug Them

The main source of dissatisfaction centers, as in the 1978 survey, on management and organizational problems. Politics and bureaucracy are specifically reported by 27% (see Figure 3). Those who changed their job because of management may not have improved their situation in this regard.

Disenchantment with the organization focuses on "power politics" played in both large corporations and government agencies. Younger respondents, less familiar with the workings of mammoth hierarchies, complain about this more often than older professionals.

Career factors are most unsatisfying for 22%. Leading the list is lack of advancement, in their words, "nowhere to go," "no future," "no definite career path," and "a lack of mobility—horizontal or vertical." Those dissatisfied with compensation resent not being paid for overtime, not receiving bonuses, and management's failure to relate salary to performance and/or increased responsibilities. Others don't like the "hit or miss" quality of training.

The work, which so many find exciting and stimulating, is boring to 16%, particularly the older survey participants. They hate "paper-pushing projects," the "drudgery of documentation" and maintenance—and the lack of challenge.

Their working conditions come in for criticism as well. They heartily dislike the high level of job stress to which they are submitted: long hours, understaffing, poor physical layout, in short, "high-pressure, high-tension, Theory X environment." Working on outdated equipment and systems is a further source of discontent, e.g., "being 'closet-cased' on dinosaur applications."

"Working With Morons"

The caliber of people they work with and those they work for causes additional dissatisfaction. They express it as: "working with morons," "unreasonable users, underachieving subordinates," "immature trainees," "political hirings of incompetent people."

How are they doing financially? According to survey results, the employee doing best is a male dp manager, at least 40 years old, with an advanced degree, 20 or more years in the field, and similar tenure with his employer—a Fortune 1000 computer/dp manufacturer with a very large dp staff, located in a major metropolitan area on either coast.

Figure 4 gives salary ranges and medians, overall and by sex and age. It shows that men are paid more than women and, as would be expected, older respondents earn more than younger ones. But there doesn't seem to be much difference in the earnings of dp staffers with associate's certificates and those who do not report any degree.

Managers are better compensated than those with staff functions—no surprise—but systems/software designers are paid nearly as well. Among the other functions, applications programming is the least financially rewarding.

What kinds of employers offer the most compensation? Employees of corporations in which data processing is the raison d'être average between $40,000 and $44,999. Next best paid are respondents in utilities, followed by government workers. People who earn the least are those who work in academia. Fortune 1000 salaries average nearly $5,000 more than those paid by other organizations ($42,000 as compared with $37,100). As a rule, the larger the data processing department, the higher the compensation.

There is also some variation in salary by location. The highest median is reported in the Mid-Atlantic states, $40,500, followed by $40,000 in the West and $39,900 in the Southeast. Below the average for the overall sample ($39,000) are salaries in the Southwest, $38,700; in New England, $37,800; and in the Midwest, $36,500.

Generally, programmers and analysts seem content with their salaries, although few mention compensation as the most satisfying part of their work. Eighty-three percent describe themselves as satisfied, 25% highly so, 58% moderately. Only 16% are dissatisfied—14% somewhat, 2% very. These percentages are virtually the same as were reported in 1978.

By geographic region, satisfaction with earnings relates, in general, to salary level, but there is one exception: respondents in the Midwest are apparently as happy with their lower salaries (84%) as their more highly compensated peers in the Mid-Atlantic (83%), Southeast (83%), and Western (86%) regions.

Who They Are

There are more women in this year's sample, 18% compared with just 13% in the 1978 study, and the current participants are a bit older. The median age for men is 39. For women it is 36, suggesting that their entry into the field is more recent. Eight years ago the average age for both sexes was in the 25- to 34-year range.

As before, 95% are college educated, 57% with undergraduate experience, 38% having taken graduate courses. There is virtually no change in the degrees they hold: 8% associate's, 46% bachelor's, 25% master's, and 2% doctorates. In both surveys, 19% of the sample did not have college degrees. Not all majored in dp, computer science, or math. Many majored in business administration, engineering and science, social sciences, liberal arts, or education, with wide-ranging academic specialties, such as Far East studies, Spanish linguistics, anthropology, and religion.

In spite of their impressive academic credentials and access to formal training programs, half of them say they got their best training on the job and through self-teaching. Employer and vendor training programs were other sources of training.

By primary job function, systems analysis/programming dominates the sample: 17% in systems analysis, 29% in systems analysis/programming. Another 19% describe themselves as programmers—12% applications, 7% operating systems. Management positions are held by 17%. Of the rest, 9% are in systems and software design, 3% in database administration, and 9% in other functions, including quality assurance, security, consulting, and technical, operating, and marketing support. The 1978 sample was slanted more toward programming (43%). Systems analysis/programming comprised 35%, management 14%, systems design 21%, other functions 3%. (Multiple disciplines were reported in both samples.)

While the 1986 sample population is experienced and occupationally mobile, there is less job movement than eight years ago. The term "job hoppers" does not apply here: 61% have been in dp for 10 years or more, and 40% have remained with their present employer 10 years or more. The current group is slightly more experienced than 1978's, in which just 51% had 10 years in the field, 30% having spent 10 or more years with the same employer. In both samples, 81% had been in the field six or more years, but more stay with the same employer now than did then.

Furthermore, 30% of the sample are working for their first employer. Another 44% have had just one or two others. Only 13% have had three dp employers, 6% report four, 7% report five, and less than 1% report six or more prior dp employers. The pattern was essentially the same in the 1978 survey, but because the typical current respondent has been in the field longer, the pattern is further evidence of a trend toward staying put.

Their employers are in both the public and private sectors: 25% of the respondents work for agencies of the federal, state, or local government; 24% in non-dp manufacturing or processing facilities; 17% for computer/dp manufacturing, services, or consulting organizations; 13% in business or financial firms; 7% in academia; 5% in utilities; and 9% in other establishments such as research and development, transportation services, health care/medical, wholesale/retail trade, etc. Moreover, 38% are employees of Fortune 1000 companies.

Responses came in from all over the U.S. The Southeast, Midwest, and Northeast each checked in with about 23% of responses; about 10% came from the Southwest; and about 20% from the Mountain and Western states. Approximately half the sample work in nine major metro areas: 16% in New York, 10% in Washington, D.C., 5% in the combined Bay Area (San Francisco, Oakland, and San Jose), 5% each in Los Angeles and Chicago, 3% each in Houston and Boston, and 2% each in Detroit and Minneapolis/St. Paul.

Except for some minor deviations, the characteristics of the 1978 and 1986 samples are comparable.

FIGURE 4 Salary by Sex and Age Group

	SEX			AGE GROUP								
SALARY RANGE	TOTAL (1,751) 100%	MALE (1,420) 81%	FEMALE (315) 18%	UNDER 25 (35) 2%	25-29 (218) 13%	30-34 (311) 18%	35-39 (359) 21%	40-44 (322) 18%	45-49 (236) 13%	50-54 (144) 8%	55-59 (93) 5%	60 OR OVER (28) 2%
No. of respondents in sex or age group = 100%	%	%	%	%	%	%	%	%	%	%	%	%
Under $25,000	8	6	17	40	21	10	6	3	3	4	2	0
$25,000 - 29,999	10	9	15	28	23	14	10	5	5	3	3	7
$30,000 - 34,999	17	16	22	20	30	23	17	14	10	6	5	14
$35,000 - 39,999	18	18	19	3	15	21	24	18	13	15	21	14
$40,000 - 44,999	19	21	13	—	5	15	20	26	23	28	27	29
$45,000 - 49,999	12	13	6	—	2	10	12	12	21	14	16	7
$50,000 - 54,999	8	8	5	3	*	4	5	10	12	14	13	11
$55,000 or more	7	8	*	3	*	2	6	10	12	15	12	18
No answer	1	1	2	3	2	1	*	2	1	1	1	0
Median salary (in $ thousands)	$39.0	$40.2	$33.9	$26.5	$30.8	$35.4	$38.4	$41.9	$44.0	$43.9	$43.4	$42.5

*Less than 1%

Note: The few respondents who did not specify sex or age group are excluded from the sex and age analyses.

How do they rate their chances for advancement? A slim majority, 54%, are satisfied, but 45% are not. The 12% who are "highly" satisfied are offset by 12% who are "very" dissatisfied. This ambivalence is not surprising in view of the lackluster hopes for advancement we've already noted. It represents a more negative viewpoint than was reported eight years ago. Then, 60% were optimistic about advancement opportunites, and only 40% were not.

Older Respondents Gloomy

The "under-35s," who may not have experienced competition for a higher-level job as yet, are somewhat more positive. Older respondents, aged 50 or more, are decidedly gloomy.

Particularly frustrated is the 50-to-54 age group, still hoping for upper-echelon positions. For the most part, the longer a programmer has been with his or her present employer, the less satisfied, but discontent does lessen for those over 54; perhaps diminished expectations lead to less discontent with the status quo.

Prospects for promotion appear brighter in the Fortune 1000 companies (60%) than in other organizations (51%). As might be expected, the larger the dp department, the more satisfied programmers and analysts are likely to be with advancement opportunities, since more openings are potentially available.

But suppose a programmer is angling for a new job. What does it look like on the street? How do programmers and analysts see the job market at their own experience levels compared with five years ago? Are more or fewer opportuni-

"Management Has No Earthly Idea . . . ."

The programmer's perception of how management views the dp function was another facet of the management/dp relationship the survey investigated. Participants were asked, "Do you think management adequately appreciates the contribution the computer/dp department makes to your organization's overall operation? Why do you [don't you] think so?"

A bare majority, 52%, feel appreciated and answer yes, 36% say no, 11% don't know, and 1% didn't reply. This shows no significant change from the previous survey. It is no surprise that in the large dp departments of computer/dp manufacturing or business and finance firms, there is widespread feeling that management is appreciative. People in non-dp manufacturing/processing or utilities, however, hold the opposite view.

The 30-to-44 age group feels relatively unappreciated by management, since the promotions they strive for are evidently not forthcoming.

The yes responses: they know they're appreciated because management tells them so. "Praise from above flows bountifully," says one respondent. Others report "numerous accolades from management," "positive feedback," and "always getting compliments." They bask in the recognition and respect: "My input is sought after, my suggestions implemented."

Those who work in dp-intensive organizations say that their employers couldn't do without their work. "They have to appreciate dp. Otherwise, they would have nothing to sell!" "Our products make the profits"; "It is the life blood of our business"; and "We are a dp service bureau—that's the name of the game!"

The no responses: managers don't understand dp and don't want to understand, the unappreciated complain. They view management as "either computer illiterate or computer phobic"—distrustful, resentful, and fearful of the technology and the people who use it. They report sarcastically that management "has no earthly idea of what dp people do," "thinks that "anyone with 10 days' training can perform the work," and "You push a button and bingo! it's done." Other managers are described contemptuously as treating dp as a car and programmers as auto mechanics.

These respondents say they are taken for granted, not treated as true professionals—never told "good job" but always reprimanded for mistakes. They are not regarded as partners of management, but almost as adversaries. Poor management in the form of indifference, lack of communication, and a bureaucratic and "speak only when spoken to" style were also cited. From non-dp-oriented industries come reports that dp is considered overhead, "a necessary evil," and somewhat "like a spare tire, i.e., we have a specific purpose, and when we're needed, we're needed. Otherwise, we tend to be excess baggage."

FIGURE 5 Number of Job Opportunities

(NOW VS. FIVE YEARS AGO)	TOTAL (1751)	YEARS OF EXPERIENCE UNDER 2 (43)	2-5 (270)	6-9 (349)	10-14 (320)	15-19 (313)	20 OR MORE (437)
No. of respondents in experience level = 100%	%	%	%	%	%	%	%
More opportunities now	35	28	39	36	34	38	30
Fewer opportunities now	23	28	15	23	24	19	30
About the same	25	5	21	22	27	29	28
Don't know/no answer	17	39	25	19	15	14	12

How Did They Get Their Jobs?

Have programmers and analysts changed their job-hunting techniques since 1978?

Most frequently (32%), those surveyed applied directly. The more experience and tenure they had, the more likely they were to have done so. The older respondents (45 and above), in particular, went straight to the employer.

Seventeen percent went through employment agencies or search firms. The method was effective for those tenured five years or less, but not for mature professionals.

Sixteen percent responded to recruitment ads in newspapers or trade/professional journals. Women and young dp staffers relied heavily on advertising. In fact, for the "under-25s" it was the job-search method reported most often. Furthermore, recruitment advertising was used consistently by all age, experience, and tenure sectors except the highest tenure level.

Referral by a company employee (16%) or a business associate (11%) were other ways they gained entrée. The most senior respondents, 60 or older, used referrals more often than others.

Ten percent were recruited from college. The "under-30s" and those with little or no experience were more likely to have been recruited this way than their older, more experienced coworkers. Among Fortune 1000 respondents, 15% were recruited on campus, an indication that the recruitment efforts of these firms in the college market are productive.

Other methods were reported by 3%, including intracompany transfers, recruitment by the company, and civil service or other competitive government exams.

The modus operandi was the same eight years ago, but college recruiting and responding to recruitment advertising have increased since then, by 5% and 4% respectively.

ties available? Overall, the survey revealed cautious optimism. While more are upbeat than are pessimistic—35% to 23%—a quarter of the respondents see no change, and 17% don't know or didn't answer.

Figure 5 shows how they answered by level of experience. The 20-year veterans are least unsure about the state of the job market. They've been there, know the market, and are the most negative: fully 30% perceive that there are fewer openings now.

The optimists in the sample see more widespread use of computers as the principal reason for their rosy picture of dp job availability. Optimists talk in terms of "exploding demand for applications development," and point to CAD/CAM, graphics, and spreadsheets as areas not widely available five years ago.

Why do others see their employment prospects as worse than five years ago? Mainly, they feel the pressures of a competitive job market. According to the pessimists, there is a glut of dp people. Those with minimal experience think the problem is a need for more experience, but seasoned professionals are feeling the crunch, too. Working professionals say the flood of entry-level people pouring out of school is reducing their opportunities. "New kids are cheaper," they say, and from all over the country come responses that indicate cost-conscious companies don't want to pay high premiums for experience; employers can train—and pay less to—a stream of well-educated, new college grads.

Pessimists also blame the sluggish economy in the nation and in their own areas. As evidence, they report seeing fewer recruitment ads in local newspapers.

Canned Software Dispiriting Trend

They also mention several other reasons they think the job market is not as good now. For one, the dp field is growing at a slower pace than it used to. Also, in a tight market, employers can be more selective, hiring better educated and more experienced people. The abundance of prepackaged or "canned" software is another dispiriting trend to the pessimists. "You can buy any program you want for $100, instead of paying $20,000 for a programmer," explains one respondent. Changes in computer technology and equipment and the need for candidates with specialties further erode job opportunities. Growing use of the new, such as pcs, and declining use of the old, i.e., 3GLs, is bad news for staffers with the "wrong" experience.

Optimistic or pessimistic, only 2% of the sample say they hope to leave the dp field within the next few years, but many are looking for some kind of change. The largest number, 39%, want to be managers, 26% specifically in dp or MIS. A reassuring 20% want to remain as professionals, 8% at just their current level. Retirement is the aim of 11%, 5% want to do consulting, and another 5% want to be self-employed, in dp or otherwise.

What can we conclude from this career research? A key point is that most dp professionals are still fascinated with their work. This and their generally reported satisfaction with salary seem to compensate for day-to-day annoyances. Few want to leave the field.

A growing concern is with the lack of opportunities for advancement. Today's programmers and analysts feel acutely the crunch of too many staffers chasing too few promotions.

Although most see more job opportunities today at their level than five years ago, it is painfully evident that not all who have changed jobs to get ahead have achieved their goals. ■

Marjorie Freedland is vice president/director of research at Deutsch, Shea & Evans Inc., New York, the human resources advertising, research, and communications organization.

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DATAMATION®

APRIL 1, 1987
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INTERNATIONAL EDITION

Japan Marks '86 Rec
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In London, Ending
Four-Session Climb
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DOLLARO
MARCO

Budgeting in an Uncertain Economy

SPENDING SMARTER:
A ROUND TABLE
1987 DP BUDGET SURVEY

PLUS: THE INTEGRATED PROJECT SUPPORT ENVIRONMENT
FORTRAN AT 30 MODELING WITH MICROS

DATAMAT

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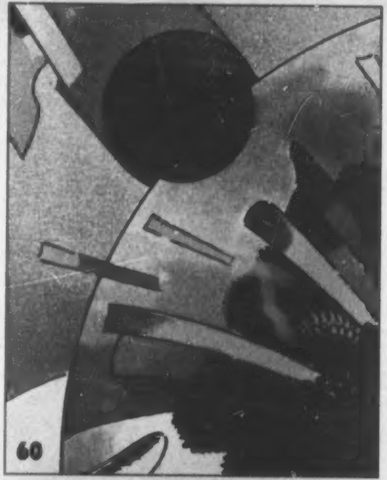

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3-D cover illustration by Ajin

INTERNATIONAL
EDITION

APRIL 1, 1987
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NUMBER 7
THIS ISSUE, 195,090

1987 JESSE H. NEAL AWARD

Editorial

DATAMATION Team Honored

David R. Brousell

Ralph Emmett Carlyle

Karen Gullo

Parker Hodges

Willie Schatz

Kenneth Surabian

On March 18, six DATAMATION staffers received the ultimate award in the business publishing field. Managing editor Parker Hodges, news editor David R. Brousell, associate news editor Karen Gullo, senior writer Ralph Emmett Carlyle, Washington bureau manager Willie Schatz, and art director Kenneth Surabian were each presented with the 1987 Jesse H. Neal Editorial Achievement Award by the Association of Business Publishers.

DATAMATION's team was selected as number one in the hotly contested category of Best Department, Section, or Column for its outstanding work on the magazine's Behind the News section. We have always been very proud of the section and all the contributors to it. We are especially proud that the board of judges has recognized, as you have, the value of the Behind the News section.

Its selection further proves the global importance of information processing and its continuing impact on virtually every aspect of society. A small sampling of stories appearing in Behind the News during the award period (November 1985 through October 1986) covers computers as a target of international terrorism; computer and communications research funds for the Strategic Defense Initiative; mergers' effects on users and suppliers; computers in the Bhopal tragedy; and what MBAs are taught about information processing.

We are honored by our award-winning journalists and art director and honored too that you continue to demand the excellence that sets our goals at the pinnacle of our profession. ■

George R Davis

GEORGE DAVIS
EDITOR-IN-CHIEF

SOFTWARE

A Game of Leapfrog

Two RDBMS firms are racing to provide pc-based products, but users say they aren't working fast enough.

BY EDITH D. MYERS

With the intensity of crosstown football rivals, Relational Technology Inc. and Oracle Corp. have hotly competed in relational database management systems (RDBMSs) since the dawn of this decade.

Both firms are attacking microcomputers, the newest frontier for RDBMSs, with a fervor. But their efforts have not come fast enough for users, who say they are tired of waiting for overdue products.

The latest move came from RTI, Alameda, Calif., which in February introduced Ingres for Pcs, a pc version of the Ingres RDBMS the firm has been marketing in the mini and mainframe world since its incorporation in 1980.

On the heels of the announcement, Oracle, Belmont, Calif., was quick to point out to any who would listen that it has had a micro version of its Oracle RDBMS for two years. Now Oracle is promising a new version of the product this month that will contain all of the functionality of the mini version of its product's release 5.1.

Both companies' products were about three months later than their scheduled release dates. Oracle and RTI say the products were delayed because of technical difficulties that needed correcting. Says Larry DeBoever, a consultant with Digital Consulting Associates, Andover, Mass., "Everybody is late, and this is uncharted ground."

Small consolation to users. Les Loomis, a staff engineer with Xerox's Document Systems Business Unit, Sunnyvale, Calif., says of Oracle's promise, "First they told me January, then February, now it's April. I'm real disappointed." Loomis has been using Oracle's pc product for a year and a half and he likes it a lot. "I feel I'm using the Cadillac," he says. Originally, he had planned to use the pc product to develop applications for uploading to a VAX but "I found I could do most of what is needed on the pcs."

Relieving the Pressure

He did find report generation with the pc product limited because of limited RAM. "I'm told the next version will have enhanced extended memory to relieve the pressure on report generation."

Another Oracle user, Larry Byrne, dp manager for E.R. Carpenter Co., Richmond, Va., is luckier than Loomis. As an original beta test site for the pc product, his firm was awaiting delivery of the new version at press time. "The problem now is that it runs in 512K [of memory], but then there's not much left for anybody else."

Greg McCue, president of Tamarisk, a consulting firm headquartered in Mystic, Conn., was eager to get Ingres for the PC and could have done without the wait. "I'd been waiting two years," he says. He's more than happy with what he got as a beta user: "It's a programmer's dream. It has all the functionality of the mainframe version [of Ingres]."

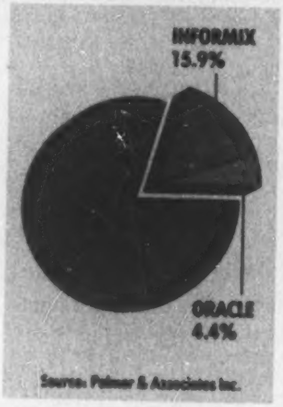
The same functionality as the mainframe version is, of course, what Oracle is promising with its new release. DeBoever of Digital Consulting feels that Oracle, in introducing its pc product two years ago, "did what was sufficient to be able to say they had a product on the pc. They beat RTI, which chose to get it done well before releasing." He says of Ingres for Pcs, "It's superb technology. Now we'll hold our breath to see if they can market it."

Two benchmark comparison studies, one done last fall and one in February of this year, show RTI's Ingres for Pcs a clear number one in performance. One study was conducted by the University of Stuttgart, West Germany, and the other by Palmer & Associates Inc., Duluth, Ga.

RTI and Oracle weren't the only players in the benchmark studies. The Stuttgart study included Informix SQL, from Informix Software Inc., Menlo Park, Calif.; dBase III, from Ashton-Tate, Los Angeles; and R-Base 5000, from Microrim, Bellevue, Wash. Of these, only Informix SQL qualifies as an RDBMS, and it was the only additional product Palmer studied.

In 10 separate tests at Stuttgart, Ingres earned 10 first places, Oracle five second places, and Informix SQL, five third places. Palmer says he tested 22 queries under five different conditions of indices for a total of 110 queries. He says Ingres took first place 87 times and tied for first with Informix three times. Informix had 15 solo first places and Oracle five.

First-Place Finishes



Source: Palmer & Associates Inc.

A benchmark study shows the three leading relational database management system products for microcomputers.

"EVERYBODY IS LATE DELIVERING."

Informix SQL was introduced in the summer of 1985 and is, in the opinion of Laura King, vice president and a cofounder of Informix Software, a leading contender in the RDBMS-for-micros arena. King feels her company has an edge because "we've built from scratch on the micro whereas they [Oracle and RTI] are coming from the mini and mainframe world with big, ungainly creatures."

Howard Bachrach, president of Bachrach-Woods Inc., Dallas, which develops custom systems for Fortune 1000 companies, has been using Informix SQL since it was first introduced because "I want to position my clients for internal growth on any systems I develop from the pc on up." When he selected Informix SQL, he felt it was the only game in town. "There are others out there now and they're probably all close in function, but I've been with Informix so long and have such confidence in their skills and their strategic direction. Still, if something better comes along . . . ."

Earl Mott, manager of advanced manufacturing and engineering systems for furniture manufacturer Hayworth Corp., Holland, Mich., chose Oracle for the pc. He was familiar with the minicomputer version of the product from a previous job. "We ordered the pc and mini product and a DEC VAX, all at the same time with the intent to program on the pc applications to run on the VAX," Mott says. "But the VAX was late in coming and we had the pcs so we started on the pcs, both programming and running applications. When the VAX was delivered we literally passed programs to it without changing a single line."

Tom Greenwald, president of Why R+D, a San Antonio developer of claims processing and membership enrollment software for health maintenance organizations, and a beta site for RTI's pc product, decided he wanted to go relational two years ago and chose Ingres because it would work on a variety of machines. He says the pc product "takes the load off the mainframe."

"FIRST THEY TOLD ME JANUARY, THEN FEBRUARY, NOW IT'S APRIL."

McCue of Tamarisk says he likes the Ingres pc version because "after working with Ingres all day at the office, I can go home and work on my pc in the same environment, and it can do so much more than dBase," which he had been using at home. He says he has seen Oracle at work, but prefers RTI's offering because "I like the style of Ingres." He feels some people choose Oracle "because it's nice to go with somebody who has sold a lot."

Charles Nocera, president of Enhanced Systems and Services, Westminster, Colo., is a value-added reseller for both Ingres and Oracle. He considers Ingres "technically better," but he'll continue offering Oracle because "there are people out there who want it, simply because it's been around longer."

RTI, Oracle, and Informix are hoping the 386 can enhance what their pc products can do. Informix claims to have the first relational database to use the Intel chip. King says both Informix SQL and another product, Informix 4GL, will be available on the Intel 80386 in the middle of the second quarter of this year, "taking advantage of the full 32-bit mode."

Ed Forman, group product marketing manager for Ingres for the PC at RTI, says his company plans to offer a micro version of Ingres that will bring the 386 pc into Ingres Star, the company's distributed relational database offering (see "Distributed DBMSs: In Search of Wonder Glue," Feb. 1, p. 41).

Eugene Shklar, director of marketing, pc product line, for Oracle, says 386 pieces will be part of the version to be announced in April. "It will bring mainframe capability to the desktop," he says.

"It's a competitive field," says Michael Howard, a consultant with the Seybold Group in San Jose, "and Oracle and RTI are highly competitive. They keep leapfrogging each other."

As in any sport, sometimes the players change teams. In January, Oracle announced that Peter R. Tierney, longtime corporate vice president of marketing for RTI, had joined the Menlo Park company as vice president of marketing. Says Tierney when asked how the Oracle pc product stacks up against the competition, "It's an apples and oranges type situation." ■

BENCHMARKS

Markups

IBM has increased equipment rental prices and license charges on about 240 software products by an average of 10% and raised per-call maintenance fees by about 15%. The company says the increases are the result of its normal business review. The 10% increases in one-time software license charges are effective immediately, affecting software across IBM's product line. The increase in hourly maintenance charges to $115 from $100 also is effective immediately. The maintenance charges are increased for magnetic tape products, including the 3510, 3411, 3420, 3422, 8809, and 3803 tape controller. IBM also says that certain information network products, including Information System 2 Sessions, will increase an average of 6%, effective April 1.

Markdowns

Digital Equipment Corp. is offering a one-year warranty on all hardware products purchased after March 2 as part of a new series of business-practice changes. The warranty includes installation, parts, and labor. A new dollar volume-based discount schedule that gives end-users and resellers equivalent discounts for large system purchases also was disclosed. Offering discounts of up to 16% for up to $10 million annual purchase levels, the schedule replaces separate VAX, MicroVAX, and PDP-11 discounts. The company has also agreed to requests by its Digital Equipment Computer User Society to permit operating system license transfers with used equipment (see "Battling Out of a Pricing Corner," March 15, p. 17). Separately, the company raised certain VAX software prices while lowering memory and disk-drive prices. Taken together, the changes should not raise system prices. They are designed to encourage customers to choose Digital memory and disk drives, says Harvey Weiss, vp of U.S. sales operations. New versions of the VAX 8200 and VAX 8300 that employ faster semiconductor parts and sport a lower price tag also were released. When combined with higher software fees for the multiuser MicroVAX II configurations, the new VAX 8230 and VAX 8330 hope to shift appeal away from the MicroVAX II.

New Unix

AT&T and Microsoft Corp. say they will market an operating system for microcomputers based on the Intel 80386 that will be compatible with both Microsoft's Xenix System V and with AT&T's Unix System V release 3.

The move will eliminate compatibility differences between the two implementations of Unix. The two companies say the combined operating system will be available in early 1988. They say they will continue to market their current Unix versions until the new product is available. The new product, to be called Unix, will support, without modification, applications written for Xenix and Unix V release 3.

At the same time, Microsoft officials say initial availability of the next generation of the company's MS/DOS operating system for 286-based and 386-based microcomputers has been delayed until late summer. The so-called A/DOS version of the operating system standard had been expected to be announced last month. Microsoft says A/DOS will be shipped to software developers in August. Microsoft won't say when the new version of MS/DOS will be generally available. The delayed version reportedly would support protected mode and larger internal memory addressing space. ■

This year's budget survey confirms the word from the grapevine: for the first time ever, MIS managers have budgeted more for minicomputers than they have for mainframes. Overall, budgets for 1987 are about what they were for 1986. Everybody is spending more on micros than had been planned, and personnel costs continue to take the biggest budget bites.

1987 Dp Budget Survey

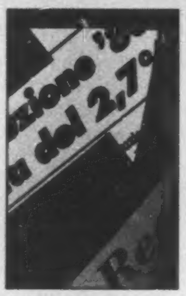
Japan Marks '86 Re
Current Account
on gains
La produzione '8
d salita del 2,7%
STOCKS INCH UP

3-D Illustration by Ajin

BY PARKER HODGES

For a while now, stock analysts and dp pundits have been high on Digital Equipment Corp. and down on IBM. Habit, however, made many scoff at the trendy talk pitting a "hot" company against the industry's longtime leader. But this year's DATAMATION Data Processing Budget Survey delivers some troubling news for Armonk: for the first time ever, MIS managers are budgeting more money for minis than for mainframes. The visions of the MIS fashion mavens have, for once, been confirmed by the numbers.

Dp managers from shops of all sizes report sizable drops in their mainframe plans for 1987. Respondents report that they've projected 7.4% of their total 1987 dp budget for mainframes, down from 8.3% in 1986. MIS managers from Fortune 1000 companies report the mainframe component of their budgets is down to 10.9% from 1986's 11.9%. Perhaps more telling is a comparison of what



managers *thought* they would spend on mainframes in 1986 to what they *actually* spent. Responding to last year's survey, managers said they would use 11.9% of their budgets for mainframes; this year they report they actually used 8.3% in 1986. For Fortune users the difference was as dramatic: they planned to spend 15.4% and actually spent 11.9% in 1986.

Pattern Just the Opposite

The pattern for mini money at Fortune 1000 companies was just the opposite: people spent more than they had planned. In response to last year's survey, those big users said they had allocated 8.2% of their budgets for minis. They actually used 10.2%. Managers for all sites surveyed, however, proved to be better forecasters: they forecast they'd spend 10.4% and report that expenditures were just that.

Otherwise, the budget news is fairly flat: it looks like another no-growth year for dp spending. While last year's survey suggested—based on managers' expectations—that there would be a slight rise in MIS expenditures, the truth proved otherwise.

The average dp budget in 1986 actually fell a few thousand dollars from the previous year, ending up at $1.6 million, about $100,000 less than the MIS managers had expected to spend. MIS managers are nevertheless hopeful that 1987 will bring them more cash to manage; they report an average dp budget of $1.7 million for this year.

It is no surprise that MIS managers at Fortune 1000 companies proved better funded. They also bucked the overall spending trend, seeing modest growth. While they reported last year that their average total 1986 budget would be $3.2 million, the actual average 1986 budget rose to $3.3 million from 1985's $3.15 million. In 1987, however, Fortune 1000 users expect to spend no more than the $3.3 million they did last year.

This is obviously not good news for vendors. The so-called slump is beginning to look more permanent. In fact, one dp manager said recently, "What slump? This is no slump—this is reality." As Hari Notowidigdo, vp of information systems at Wendy's International, Dublin, Ohio, notes in "Getting Smarter, Spending Strategically" (p. 76), "If the computer industry is in a slump, it's because we have become better managers."

Still, MIS managers do have money to spend in 1987. Where will the cash end up? Personnel costs will consume most of it, 32.8% of the average budget, up only slightly from 1986's actual 32.7%. Fortune 1000 managers expect to trim their personnel costs, hoping to reduce them to 35% in 1987 from 1986's actual 35.5%.

As noted above, mainframe vendors can take little comfort from the budget numbers. This year, MIS budgeters plan to spend 25% less on mainframes than they do on minicomputers. For the total sample, MIS managers report that mainframes will consume 7.4% of their budget, down more than 10% from 1986's mainframe share of spending. Fortune 1000 managers say that the mainframes' share of their budgets is down sharply from 1986.

Mini makers will do much better than mainframe specialists, but they will also feel selective applications of the budget knife. Big users may make up for some of the overall sample's plans to trim purchases. While the total sample plans to spend a bit less—down to 9.9% from 10.4%—of its budget for minicomputers in 1987, the Fortune 1000 respondents say they will up the mini percentage of their budgets by 8.8%, to 11.1% in 1987.

Budget makers also expect personal computers to consume less of their budgets this year than last, down to 9.7% for all sites, down slightly to 6% for For-

FIGURE 1 **The Typical Dp Budget**

	ALL SITES AVERAGE %		FORTUNE 1000 SITES AVERAGE%	
	1986	1987	1986	1987
Mainframe computers	8.3	7.4	11.9	10.9
Minicomputers	10.4	9.9	10.2	11.1
Mass storage and memory	2.8	3.2	3.5	4.1
Terminals	4.1	4.0	4.0	3.6
Desktop publishing	0.8	1.0	0.2	0.3
Personal computers	10.0	9.7	6.3	6.0
All printers & other peripherals	4.1	4.3	3.5	3.6
Mainframe and mini applications software	3.8	4.0	3.8	3.6
Mainframe and mini systems software	2.2	2.3	2.9	2.6
Microcomputer software	2.5	2.5	1.1	1.3
Data communications	3.5	4.1	4.6	5.1
Personnel	32.7	32.8	35.5	35.0
Consultants	1.9	1.7	1.5	1.1
Outside services	3.0	3.0	2.4	2.4
Supplies	5.7	6.0	4.7	5.1
Overhead: utilities, rent	3.9	4.1	3.7	4.2

FIGURE 2 **Dp Budget Changes by Industry, 1986 vs. 1987**

INDUSTRY SECTOR	% ALL SITES	% FORTUNE 1000 SITES
Survey Average	5.1	1.2
Manufacturing, dp	2.3	U
Manufacturing, other	7.4	6.7
Dp services	6.9	NA
Government	0.7	NA
Education	8.2	NA
Finance	7.0	-3.5
Retail/wholesale trade	15.3	2.6
Medical/legal services	12.5	NA
Transportation	4.2	U
Utilities/communications	4.9	0.2
Construction, mining, agriculture	-0.7	5.5
Other business services	-5.3	-6.7

NA: not applicable; U: unavailable

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tune 1000 companies. But it seems inevitable that people spend more on pcs than they expect to: managers report they actually spent 10% of their 1986 dp budgets for pcs, a share more than 16% higher than they had reported planning for the year.

Microcomputer software's piece of the budget action is up strongly for 1987 at Fortune 1000 companies, rising 18.2%, while in the total sample, managers hope to keep spending flat at 2.5%.

Mainframe and minicomputer software expenditures, however, are headed down slightly at Fortune 1000 companies, say respondents. Budgeters in the total sample expect to spend a bit more this year: applications software costs will rise to 4% of the budget; systems software costs will grow to about 2.3% of the budget.

But dp budgeters don't have a very good record when it comes to forecasting their software expenditures. Comparing what MIS managers actually spent with what they said they had budgeted is instructive.

Last year, Fortune 1000 users reported that they had earmarked 2.3% of their budgets for mainframe and minicomputer applications; the actual share as revealed in this year's survey was 3.8%, fully 65% higher than planned. In every software category, actual share of budget was higher than planned, with most about a third higher. The best record was scored by all sites' estimates of the mainframe and minicomputer systems software share of budget: it was off by only 4.8%.

Data communications will consume more than 4% of the dp budget in 1987, up 17% over its share in 1986. But datacom spending had risen 30% the year before; while growth is still strong, apparently a lot of what needs to be connected is already hooked up.

The biggest percentage increase of budget share in 1987 will be desktop publishing. While the desktop publishing category is still small, only about 1% of total budget for the total sample, it is 25% higher than it was last year. For the Fortune 1000 sample, the share of budget will leap 50%.

The biggest losers? Probably consultants. The overall sample's plans to spend 1.7% of the 1987 budget on consultants will mark a 10.5% drop from 1986's budgets.

The Fortune 1000 reports it will hit the consultants even harder, dropping the freelancers' share of the budget by more than 25%, to 1.1%. But, here too, budgeteers don't have a very good record as forecasters: last year, respondents claimed they were going to cut consultant costs, and actual spending in this category was as much as 36.4% higher than planned.

Dp departments also spent more on peripherals last year than they thought they would, with Fortune 1000 users predicting a 2.9% share and actually using 3.5% of their budgets for the equipment. The average percentage actually spent at all sites was 4.1%, almost a third higher than the 3.1% of the budget that was planned. ■

Methodology

The 1987 DATAMATION Data Processing Budget Survey polled a cross-section of United States users from a variety of industrial sectors. The survey was designed to reflect the magazine's readership: results were tabulated for all sites, including Fortune 1000 sites, which were also tabulated as a separate category.

The survey began in early December when 5,000 questionnaires were mailed to a random sample of DATAMATION subscribers. A total of 517 were received by Jan. 9, a third of them from Fortune 1000 sites.

The industry sector that produced the most responses was computer services (23%), followed by nondp manufacturing (14%). Sixty-nine percent of the responding sites were identified as the headquarters of the organizations.

The respondents reported average 1986 corporate revenues of $325 million and predicted average revenues of $345 million for 1987. The average data processing budget for 1986 was $1.6 million and for 1987 is $1.7 million. Almost 10% of the sample, however, reported annual dp budgets of more than $5 million.

This year, the survey asked respondents to estimate spending on data processing goods and services not on the official data processing budget. The 38% of respondents who replied to this question estimated that in 1986 an average of $1.13 million was spent on off-budget dp; the same respondents expect 1987's off-budget spending to average $1.07 million.

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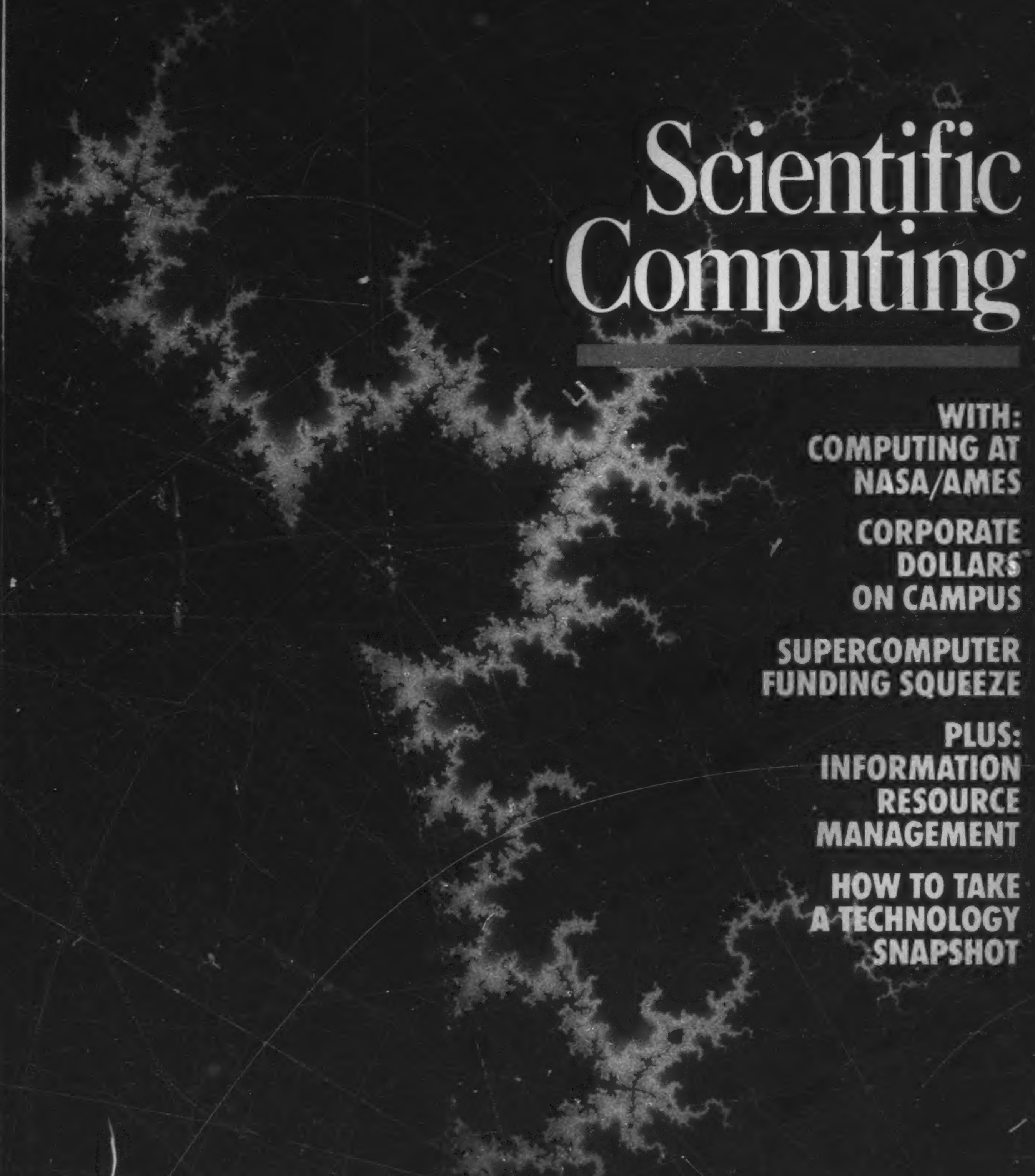

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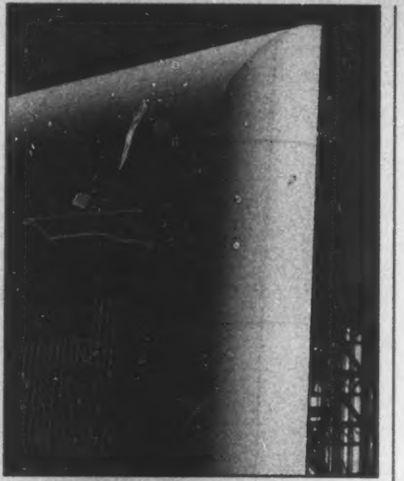

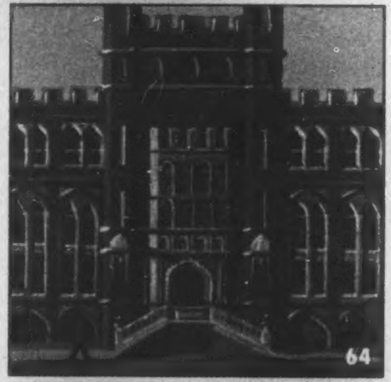

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Cover art by Richard F. Voss/IBM Research. High-resolution rendering of a fragment of the Mandelbrot set for complex quadratic iteration (B.B. Mandelbrot, *The Fractal Geometry of Nature*, 1982). Copyright 1987 R.F. Voss.

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Editorial

An Officer, a Gentleman, and an MIS Specialist

Many a vendor has proclaimed this the "year of the customer." But in courting the customer, many a vendor has failed to adopt a new marketing and sales approach to what is indeed a new MIS environment.

Today's top MIS executives are businessmen first and information processing specialists second. They know that technology and product are not in themselves a solution.

We heard this loud and clear as we sat with six top MIS managers two weeks ago in our New York offices. While we'll share much of that discussion with you in an upcoming issue, the message they hammered home signals a major change within leading MIS management. It was best said by Rear Admiral Harry T. Quast, director of the information systems division in the Office of the Chief of Naval Operations: "I am first and foremost an officer of the U.S. Navy. My 'bottom line' or 'P&L' mission is fleet readiness. My specialty toward meeting that mission happens to be information systems."

Admiral Quast sets the specs. Vendors vie to meet his needs. But fleet readiness is his first and foremost goal.

High-minded missions are being set in corporate MIS shops as well. John Singleton, chairman and president of Security Pacific Automation Co., Los Angeles, has heady goals for his MIS team: "We're not just cutting costs; we're generating profits."

When MIS can be brought to bear on the bottom line, or on a mission as critical as a nation's fleet readiness, there's no room in that sphere of responsibility for pointing fingers at vendors. The solution must be yours, and must be driven by your organizational mission.

The savvy MIS customer's search is no longer for a computer solution, it's for a business solution in which computers may play a part.

To succeed in making this the year of the customer, vendors must provide at least as great an understanding of the mission as of the machines. It's easier getting a network to work than it is getting a network to work towards accomplishing a mission. ■

REBECCA S. BARNA
EDITOR

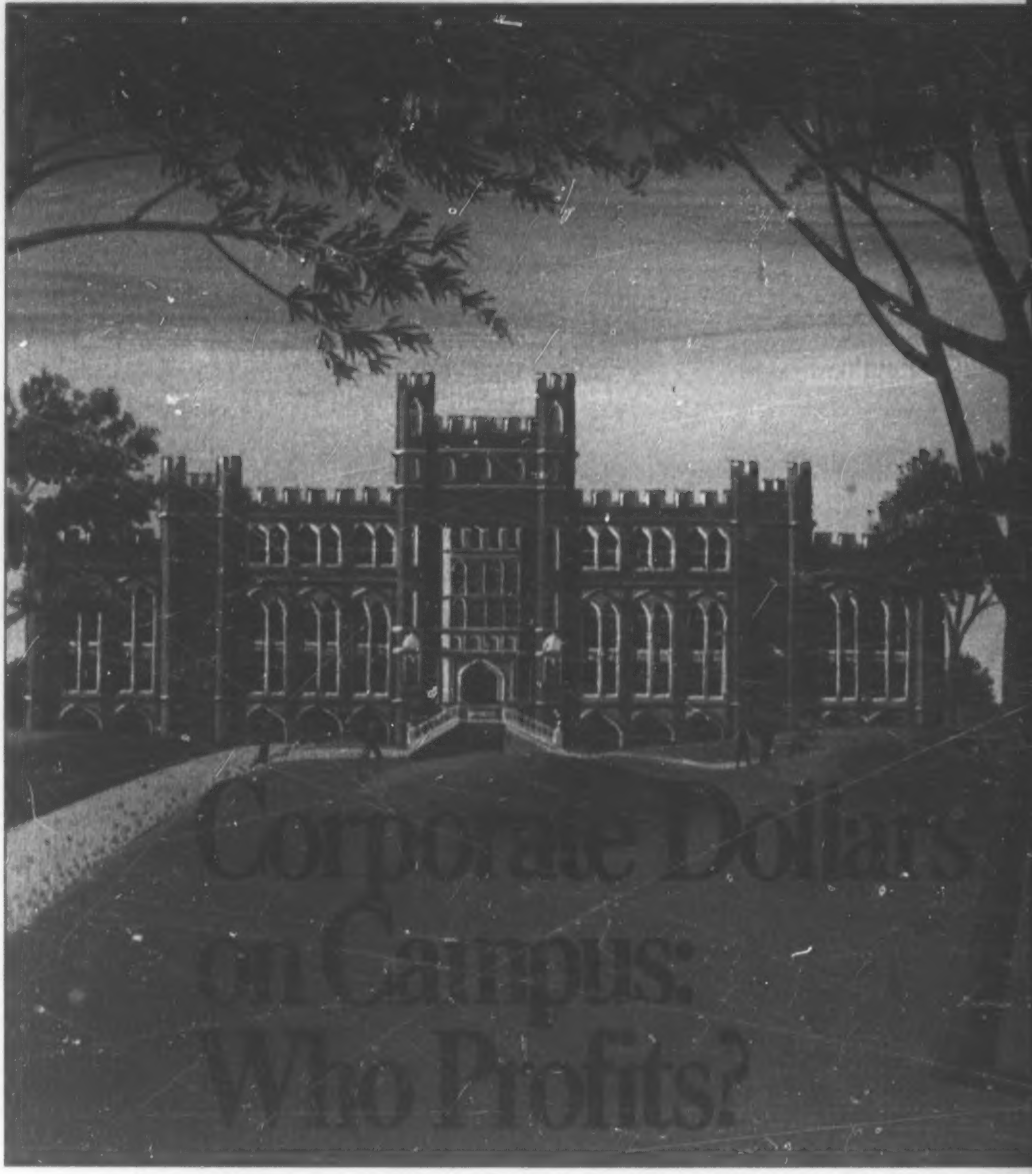


Illustration by Isadore Seltzer

Corporate Dollars on Campus: Who Profits?

In an era of declining profits and tight budgets, the amount of money spent by computer companies on university campuses in the name of both research and philanthropy continues to grow. While many firms regard these efforts as part of their regular research and development programs, others see them as a partial substitute for in-house research. Companies doling out donations generally expect to gain access to leading-edge development and researchers, enhance their own employee recruitment, and wean future customers on their products. Although it's true that some corporate spending on campuses contributes no measurable return to a company's bottom line, most businessmen and academics claim that expectations of mutual benefits are justified.

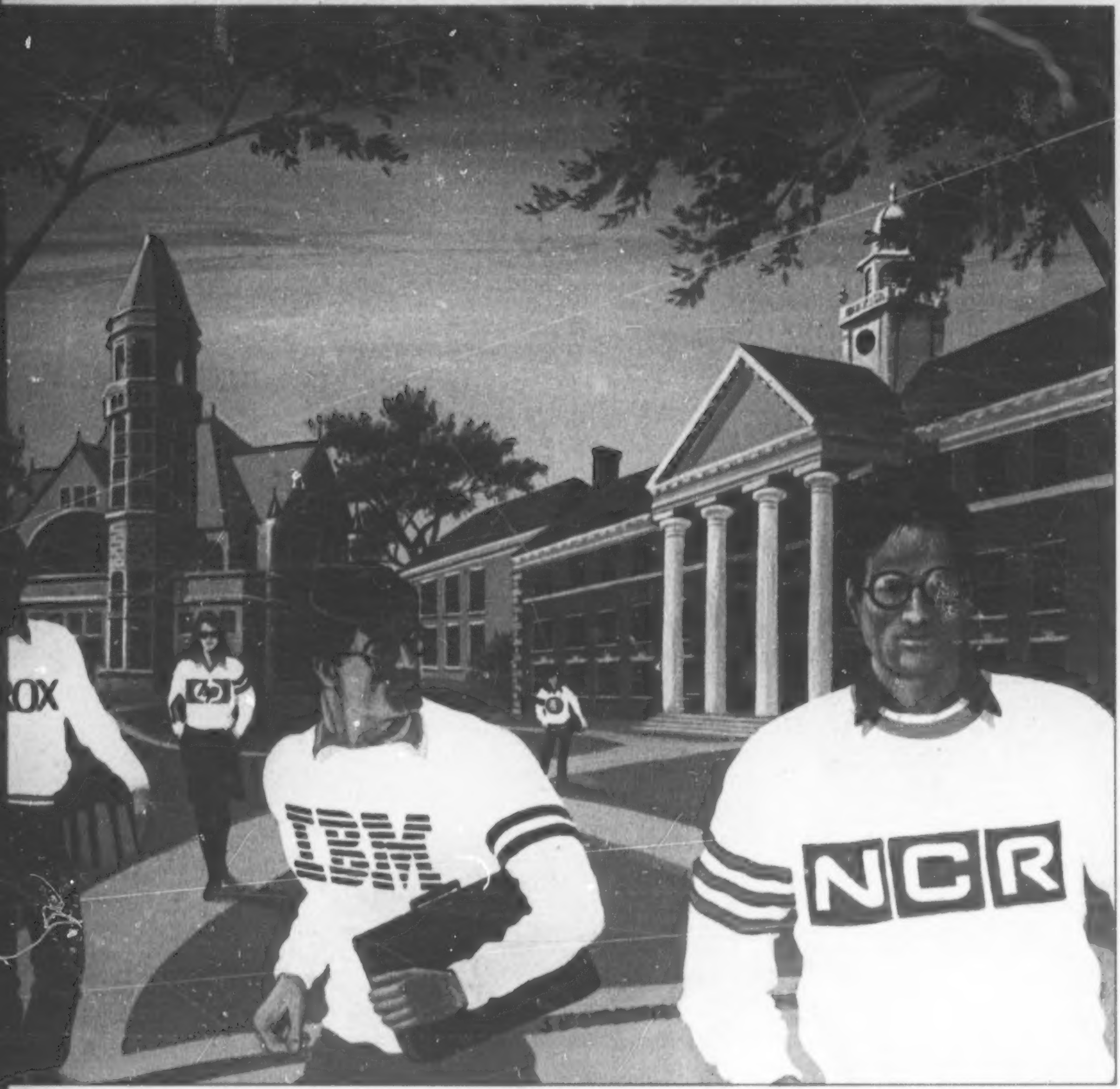
BY ED JOYCE

At first glance, it seems to be an unlikely match—AT&T providing support for genetic research at the University of Virginia (UVA). But the communications giant is doing just that through a multimillion-dollar donation of computer equipment to UVA's School of Medicine. The situation typifies much university computing today—if you're using a computer on campus, chances are you're benefiting from hardware and software donated, funded, or at least sold at a generous discount by a computer company.

The advantages of free mainframes and software for the academic community—whose beneficiaries range from elementary and secondary schools to universities and teaching hospitals—are largely self-evident, but what are the corporate sponsors getting out of these deals? Can they expect anything more than a major tax deduction and the noble feeling of supporting higher education?

Consider AT&T's donation to UVA: a $4.5 million gift of computer equipment and services, including an AT&T 3B5 minicomputer for the School of Medicine. Malcolm "Mitch" Smith, an assistant professor of microbiology at the Charlottesville, Va., university, relies on the 3B5 machine to research the regulation of gene expression and the recombination of DNA molecules. Smith freely admits that AT&T stands to gain nothing of direct value from his research.

Angie McGuire, AT&T's manager of university programs, explains that the company made the donation as part of a "philanthropic program to support higher education." The budget for AT&T's



computer donation program has doubled since 1984, according to McGuire, and last year over 120 institutions benefited. Last year, when AT&T decided to eliminate 24,000 jobs from its Information Systems Division in a cost-cutting measure, the computer donation program gave away $68 million.

AT&T's program is by no means unique. "The interaction between high-technology companies and universities is growing dramatically," proclaims former IBM vice president Lewis Branscomb. IBM invested $71 million to support educational institutions in 1985, according to Branscomb. Until he retired a few months ago, Branscomb was responsible for guiding the company's scientific and technical programs, including philanthropic and research relationships with universities. In 1985, Big Blue had committed another $127.5 million in multiyear cooperative research contracts with 205 universities worldwide. At the start of this decade, IBM's university contracts amounted to less than $5 million.

"THERE'S NO SUBSTITUTE FOR BEING PART OF THE DESIGN PROCESS."

A survey of other computer firms shows corresponding levels of support for education. Digital Equipment Corp. donated about $5 million worth of equipment during its fiscal year 1986. Its contracts for university research in various multiyear projects currently total $20 million. Hewlett-Packard awarded $50 million in grants to universities and teaching hospitals in 1986. NCR doled out $3.9 million in equipment and cash grants in 1986, and allocated another $2 million for sponsored research. Thirty-two schools have received grants from Xerox, part of a three-year program established in 1984 with a $30 million budget.

Prime Computer Inc. handed out $9 million in university grants in 1986, while CDC spent $2 million.

The fact that university handouts survive and even thrive despite tight budgets suggests that the philanthropists have ulterior motives. For example, AT&T acknowledges a tax angle in its university giving program; the equipment at UVA was donated under the Economic Recovery Tax Act of 1981, which precludes it from being used for cooperative development projects between AT&T and the university. Furthermore, to qualify for the tax deduction, the donated hardware cannot be tied to marketing or sales efforts.

Even so, donated hardware itself can represent a sort of indirect marketing effort. As UVA's Smith points out, "When students leave the university for the working world, they may or may not demand AT&T equipment, but they will expect to find Unix [the 3B5's operating system]." As it happens, AT&T chooses recipient universities based on their commitment to Unix-based systems.

To appreciate other practical aspects of equipment grants, one must read between the lines of what company officials say about their donation programs. Part of the criteria determining a university's selection in the AT&T program, for example, involves what McGuire calls its "existing relationship with AT&T"—in other words, big customers.

Indeed, many companies seem to view philanthropy as a part of doing business in an increasingly vital market. Bob Trocchi, marketing manager of the education industry group at Digital, observes, "The academic computing market has been growing three times faster than the industry as a whole." If a school is willing to develop instructional software on DEC machines for a particular subject, such as chemistry, and make it generally available, then, Trocchi says, Digital will supply hardware through a donation or generous discount just to encourage that effort.

For their part, academic beneficiaries seem equally forthright about the motives behind corporate philanthropy. At Carnegie-Mellon University (CMU), Pittsburgh, IBM is funding $32 million worth of network development under Project Andrew, which CMU officials call "the most ambitious campus computerization project in the country." Project coordinator James Morris, the director of CMU's Information Technology Center, recognizes pragmatism in IBM's donations. "IBM sees the university market as a high-growth area," he says. "ACIS [IBM's Academic Information Systems division] is one of its fastest-growing business units. The policy of contributing equipment is part of a strategy of engaging the university to gain insight into the academic market."

Earning tax write-offs, getting students hooked on operating systems, and sweetening big customer orders with possible future donations of equipment may be sound business practice, but most companies defend their programs in more exalted—and hopeful—terms. "It's well known in this industry that you must spend a large percentage of your earnings on R&D," explains John McCredie, who directs external research programs in Digital's engineering division. "At DEC that figure was close to 11% in the last fiscal year, which ranks us tenth largest in R&D spending among the nation's corporations." McCredie oversees about 100 projects at 50 different universities where, in his words, "DEC barters equipment for research."

DEC's research activity, according to McCredie, is conducted in three main areas: in the company's internal laboratories; in joint ventures with other corporations; and in cooperative arrangements with university scientists.

"University programs comprise a small part of our overall strategy," admits McCredie, "but they allow us to keep abreast of the long-term horizon, the breakthroughs that may be five, 10, or 20 years away from the market." In his opinion, a development organization is "almost being irresponsible" if its research program excludes academia.

Taking the long view, then, the question remains, what do corporate sponsors really get out of funding campus research? Steven Lerman of MIT directs Project Athena, a joint venture begun in 1983 between his institution, IBM, and Digital. Lerman emphasizes that the support of IBM and Digital, which includes five salaried employees and $25 million in equipment and services over five years from each firm, is regarded as a gift to MIT. The corporate sponsors have no exclusive commercial rights to Athena. (By contrast, IBM's agreement with CMU on Project Andrew gives the company an exclusive option to develop and market a product; in fact, IBM antici-

The Cost of Sponsoring Research

Besides IBM and GM, the 30 sponsors of Carnegie-Mellon's Robotics Institute include Oberg Manufacturing, a Pittsburgh tool and die maker with just 300 employees. All R&D spending, says Oberg's director of engineering, Harry Walters, is like "casting bread on the water" to attract fish. "You can't see fish underwater. In reality there may not be any there, and your bread may just sink to the bottom, but you'll never know unless you try."

How much do companies have to pay to try? Here's the rundown on a few currently established university research centers that have attracted corporate sponsors.

INSTITUTION	CENTER NAME	ANNUAL DUES	MEMBERS
University of Virginia	Center for Computer Aided Engineering	$10,000	11
Pennsylvania State University	Center for Electronic and Acoustic Materials	$30,000	15
Stanford University	Center for Integrated Systems	$120,000 (plus initial fee of $750,000 for building construction)	20
Rensselaer Polytechnic Institute	Center for Manufacturing Productivity and Technology Transfer	$40,000 (annual fee waived for "founding" companies that initially invested $300,000 or more)	21
Carnegie-Mellon University	Robotics Institute	$15,000 to $50,000 depending on company size	30

pates distributing Andrew as an official product in the second half of this year.)

"Athena serves as a window into the future of computing," Lerman asserts, "a laboratory where you can come and observe a large-scale network in action. Our corporate affiliates want to know what types of products fit in this environment. For example, what are the best strategies for printers and displays?" Athena now ties together 300 workstations. The network is expected to grow to 1,500 workstations in 1988 and may eventually link 10,000 stations.

MIT researchers are expected to publish much of what they learn from Athena in technical papers. Since Athena will eventually be well documented in public sources, what do IBM and Digital stand to gain from their massive contributions? "Although people will learn about the project by reading publications and visiting the campus," states Lerman, "there's no substitute for being here every day and being part of the design process. That's the primary benefit for IBM and Digital."

Bottom-Line Benefits

Digital's McCredie suggests that having access to research results "two or three years before they get into the public domain" can bring bottom-line benefits to Athena's corporate sponsors. Digital already has tapped Athena technology for one product. The X-windowing system pioneered in Athena has been incorporated in the DEC VAXstation II/GPX Color Graphics Processor, which was announced in January 1986.

Since corporations can participate in university research centers for as little as a few thousand dollars a year, McCredie believes it is "a good business investment even for small companies." Compared with in-house R&D, contracted research incurs no significant startup costs in building construction or personnel staffing, and if business slows down, a company can immediately curtail research activity simply by cutting back on the funding, an alternative that, McCredie notes, is "far less painful than laying off a staff of research scientists."

How does a small company participate in such research, and what are the chances of payback? Needless to say, dozens of universities would be delighted to help potential sponsors answer the first question. According to the American Society of Engineering Educators, MIT—to pick one example—attracted about $10 million dollars in private-sector engineering support for the academic year 1984-85. Industry pays for 15% of all the research conducted at MIT, up from 5% a decade ago.

A Close Look at Some Centers

As for determining likely payback, it's instructive to take a close look at some "centers"—center being the form of organization that many universities have successfully used to court corporate funding. Take the case of Stanford University's Center for Integrated Systems (CIS). Established in 1983 with 20 leading industrial firms in microelectronics pledging to contribute $750,000 each for the construction of a building to house CIS, the center aims to "advance the state of knowledge by orders of magnitude." Additionally, the consortium members pay $120,000 annual dues for an inside track on CIS discoveries.

For their financial support, the corporate sponsors receive newsletters, reports, seminars, workshops, and consulting arrangements. The center has an open-door policy for its sponsors, even encouraging them to place employees on-site to participate in CIS research. "Perhaps most important," says Stanford's president Donald Kennedy, "the sponsors have a chance to become acquainted with bright students, whose education we also hope to enrich through the center."

"IF YOU HAD TO JUSTIFY THE RETURN, YOU'D NEVER SPEND THE MONEY."

IBM's former vp Branscomb seconds that conviction. "Universities are invaluable to industry as a source of new knowledge, but the strongest ties result from the universities' roles as the sources of industry's future employees."

While CIS's membership roster resembles a ranking of the top 20 chip manufacturers in the country, other centers reflect a mix of large and small companies. The 30 sponsors of CMU's Robotics Institute, for example, range from IBM, Westinghouse, and General Motors to Pittsburgh tool and die maker Oberg Manufacturing Co., which boasts about 300 employees. The annual dues run from $15,000 to $50,000 depending on the size of the company. A sponsor will pay more to fund a project of particular interest.

In describing his firm's interest in the Robotics Institute, Harry Walters, director of engineering at Oberg, says, "The industrywide emphasis on automation and robotics motivated us to join the institute in 1982." He concedes that the investment in the Robotics Institute, like any R&D endeavor, can't be measured on a balance sheet. "If you had to justify the return on investment, you'd never spend the money," he declares.

Both academia and industry seem interested in justifying their partnership nonetheless. Last November, IBM convened a four-day "University Study" conference that attracted hundreds of university faculty members.

Typical of the conference's generally positive view on corporate-sponsored research was a talk given by Gary Kozak of IBM's Technical Personnel Development department. Kozak outlined the results of a study IBM commissioned on university-contracted research, which revealed that over 95% of the professors and 90% of the IBM employees sampled viewed their projects as being successful. More than 60% of the projects yielded results directly applicable or useful to IBM.

Despite such rosy pictures, some objections have surfaced as corporate funding has grown. Former IBM vp Branscomb acknowledges that "some critics of the university-industry connection are fearful of turning U.S. universities into product development laboratories," but, he says, "generally, we expect to see the work peer-reviewed and put into the public domain. IBM prides itself on its respect for academic freedom."

Overall, ties between industry and academia appear destined to grow. Experts believe such cooperation can aid the domestic economy by replenishing the reservoirs of basic discovery from which technological development flows. Still, U.S. companies may find the best indication of the value of industrial-academic cooperation by studying a familiar overseas competitor. Nearly every major Japanese corporation now sponsors research on one or more American campuses. ■

Ed Joyce is a writer based in Charlottesville, Va.

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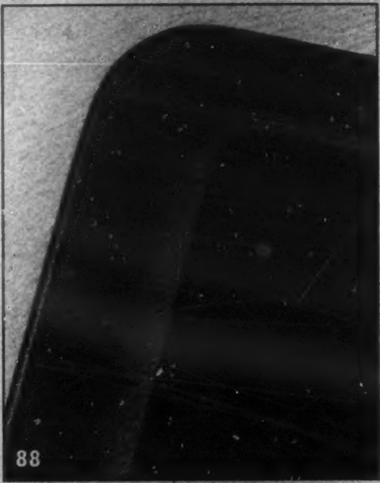

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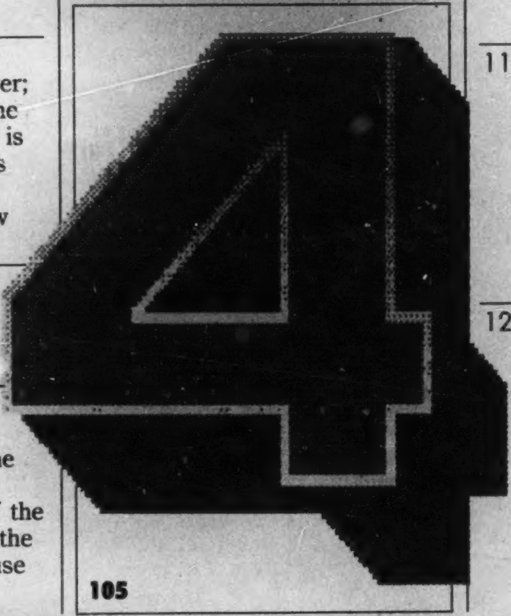

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BY LAMONT WOOD
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Cover illustration by Kerry Gavin

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1987 JESSE H. NEAL AWARD

Editorial

Not Unlike Non-Negatives

Rumblings of an industry rebound are not unexpected. Where did these rumors of cautious optimism originate? Why, from reports of lessened pessimism, of course.

Take IBM's first-quarter earnings, for instance. The facts are these: IBM posted a 23% decline in first-quarter profit to $785 million from the $1.02 billion of the comparable quarter a year ago; the decline would have been worse had IBM not had the benefit of favorable currency translations and a lower tax rate. The earnings drop would have been greater still were it not for strong mainframe and PC sales in March; these results prompted IBM chairman John F. Akers to comment that "there are some encouraging signs in our business"—the most positive (or least negative?) note from him in over a year.

Now for the interpretations. The town criers shouted out not a 23% decline in earnings, but rather a less-than-expected decline. Add Akers' "encouraging" remark, and the not-as-bad-as-predicted decline became an improvement-over-expectations, which was simplified to a tale of improvement.

"We are not unencouraged . . . " began some accounts of IBM's earnings decline. "The negative attitude toward an industry turnaround is abating," read others. Surely by now you are not unaware of the pattern.

In the wake of IBM's splashy announcement of almost 100 PC-related products, we have not gone wanting for analysis. "We are not unimpressed . . . " with the depth and breadth of this product line, say industry analysts. The new products are "certain to stem further losses in market share for Big Blue," say others. The Personal System/2 "will not foster significant short-term discontinuity" for the pc industry and its players, others speculate.

Be not uncareful as you read John W. Verity's report on results of the annual DATAMATION/Cowen & Co. mainframe survey (p. 69), which tells of "continued deceleration in dp budgets." Our lead News In Perspective stories reported by Susan Kerr, Gary McWilliams, and Edith D. Myers (beginning p. 21), which show computer users "not unconcerned" about some aspects of IBM's Personal System/2 announcements, should not go unnoticed. Most important, be not unaware of the possibility of double negatives resulting in a nonpositive.

(None of which is to say an industry rebound is not unlikely.) ■

Rebecca S. Barna

REBECCA S. BARNA
EDITOR

BIG SYSTEMS

Mainframe Users Survey: Tough Times for IBM

Decelerating dp budgets signal gray skies for the industry leader, but pcms may clean up, the 10th DATAMATION/Cowen mainframe survey shows.

BY JOHN W. VERITY

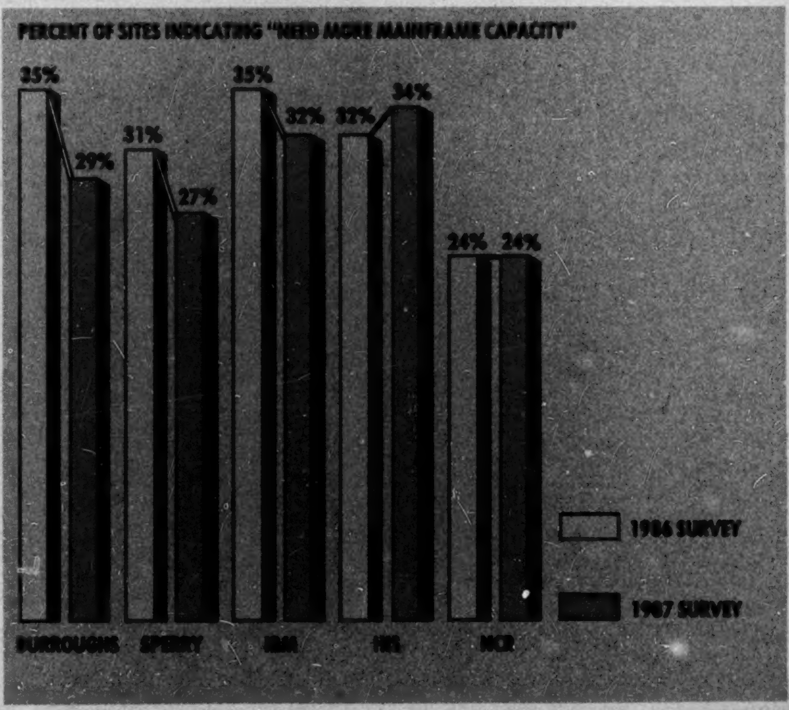
Despite upgrades for its 3090 mainframes and the beginning of shipments of its new midrange 9370s, IBM will find it hard this year to show substantial growth in its domestic mainframe revenue stream. Data processing hardware budgets are declining due to general economic sluggishness; installed mainframes possess an increasing excess capacity; and makers of plug-compatible gear seem to be retaking market share from the besieged giant.

A large sample of IBM computer sites in the U.S. and North America indicated in March that in the months to come, through December 1988, they planned to install equipment worth 31% of the value of their installed mainframe gear. That is not a shabby number, but a similar sampling taken a year earlier showed plans to acquire equipment worth 34% of the installed base. Thus, with the added negative factor of demand that is less than overwhelming for its new line of Personal System/2 microcomputers (measured before it was formally introduced), IBM this year may be hard-pressed to regain its traditional pace of double-digit growth. Improvements will come primarily from internal cost-cutting and repricing of products.

These are among the major findings of the 1987 Computer and Telecommunications Survey conducted by DATAMATION and Cowen & Co., Boston. The survey, which polled mainframe users as to their installed equipment and near-term spending plans (see "Survey Method"), also revealed the following trends:

- Peaking product cycles bode well for fairly strong shipment growth at the non-IBM mainframers, namely Honeywell, Unisys (Burroughs/Sperry), and NCR. However, those firms face increasing competition from IBM and Digital Equipment Corp. in the important areas of distributed processing and office systems.
- Pcm companies Amdahl Corp., Sunnyvale, Calif., and National Advanced Systems, Santa Clara, seem particularly well positioned to gain market share from IBM in the mainframe cpu and disk markets, where their products are beginning to ship in high volumes with competitive prices and features. Amdahl enjoys great customer loyalty on the strength of its multiple domain feature, which permits several disparate operating systems to run concurrently on a single cpu without all the overhead incurred by IBM's VM software hypervisor. Meanwhile, Storage Technology Corp. appears to be regaining lost ground in the disk drive market.
- IBM's 9370 midrange 370 processor, although accepted fairly well by users, may not produce as much incremental business for Big Blue as some may hope. Although some 60% of the 9370 systems planned for installation will replace no previously installed systems, where replacement is involved the machine appears to be capturing many applications once destined for other IBM systems. More than half of the applications intended for the "VAX killer" were originally intended for other IBM machines.
- IBM Credit Corp. (ICC) is an increasingly important factor in users' acquisition plans. It is involved in 19% of users' planned 3090 acquisitions, up from 12% a year earlier. ICC is also shown as capturing about 11% of projected 9370 installations for 1987-88 while third-party lessors gain 44% of that business.
- Growth in each and every area of the dp budget (cpu/peripherals, pcs, teleprocessing equipment, software packages, and salaries) is decelerating. Dp budgets that were expected to grow 9.7% in 1985 and 8.2% in 1986 are projected to grow only 5.7% this year. IBM hardware budgets were projected to increase only 7.8% in the coming three to five years, down from the more robust 8.6% seen in last year's survey.
- On-line transaction processing now accounts for over a quarter of all the pro-

FIGURE 1 Less Need For Mainframe Capacity



cessing done on IBM mainframes—27% this year, compared with 20% the year before. Its substantial growth (up from 17% in the 1983 survey) comes at the expense of batch and timesharing.

- The Unix operating system, although gaining considerable acceptance for workstations and departmental systems, has yet to gain much attention from mainframe users. Some 70% of the survey's respondents said they had no desire for the AT&T-developed software.
- Corporations indicated remarkably low interest in IBM's new personal computer line, as yet unannounced at the time of the survey. Asked how likely it was that they would "broadly replace" installed IBM PCs with the new machines, only 3.1% said it was "very likely." Meanwhile, users indicated increasing acceptance of PC clones during the past year.

IBM's mainframe business is now largely concentrated on the 3090 mainframe. That machine has been shipping for less than two years and yet in terms of dollar value it comprises more than a third (36%) of the IBM installed base sampled by the survey this year.

With IBM's shipping of the 3090 in high gear, Amdahl and National Advanced Systems have seen their combined North American installed cpu market share decline for the fourth year in a row. Amdahl's share as of February was just below 7% while NAS came in at just over 2%. This combined share of 9% is down substantially from the more than 15% recorded in 1983's survey.

IBM's competitors will likely regain some share in the months ahead, however, with Amdahl likely to be the biggest winner. Survey respondents indicated that for 308X/3090-class equipment to be acquired in the following 24 months, they would spend 14% of their money with pcms (2% for NAS and 12% for Amdahl). Those numbers are up sharply from the 4% total in last year's poll. Amdahl will further enjoy the fact that as users switch to its 5890 systems from the 580 series, the average price per planned Amdahl system is rising to $3.6 million in this year's survey from $1.7 million in 1986.

Asked about their attitude toward pcm vendors and their systems, respondents were decidedly upbeat this year. Some 23% of the large-scale IBM-compatible sites (up from 19% a year earlier) said they had a pcm system installed, on order, or had plans to order, and 15% (up from 14% last year) said they were con-

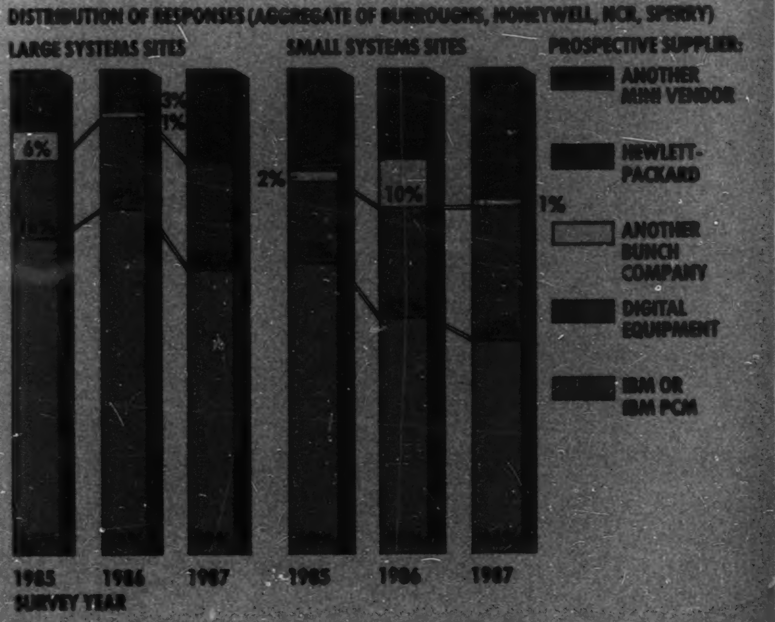
FIGURE 2 **BUNCH Users Want More Application Software**

Query: Which category of service needs the most attention by your vendor?

INDUSTRY SERVED	MOST FREQUENTLY CITED CATEGORY(S)			
	HONEYWELL	SPERRY	BURROUGHS	NCR
MANUFACTURING	Applications Software	Applications Software	Applications Software	Applications Software
WHOLESALE/ RETAIL	DB/DC Software Field Maintenance Operating System	Applications Software	Applications Software	Sales Personnel Applications Software
FINANCIAL INSTITUTIONS	Applications Software	Applications Software	Applications Software	Applications Software
SERVICE BUREAUS	Applications Software	Applications Software	Applications Software	Systems Price/ Performance
EDUCATION	Applications Software	Sales Personnel	Systems Engineering Support	Applications Software
GOVERNMENT	Applications Software	Applications Software	Applications Software	Applications Software
DEPARTMENT OF DEFENSE	Applications Software	Operating System	Field Maintenance	Systems Engineering Support

FIGURE 3 **BUNCH Users Lean to IBM and DEC**

Query: If seriously considering a change in vendors, who is the likely supplier?



sidering installing one. Among current Amdahl and NAS sites, only 12% of the former (down from 22% in 1985) and 5% of the latter (down from 24%) said they would go back to IBM when it came time to replace their present cpu.

In fact, respondents' attitudes toward IBM as a supplier took a sharp negative turn this year: while 23% of the sites in 1985 said they looked on the company more favorably compared with the year before, this year's poll found only 13% in that category. Similarly, 11% said in 1985 that their attitude was less favorable, but this year 21% held that view.

As noted above, Amdahl has pleased users greatly with its multiple domain feature, something IBM does not supply. Of those sites with the feature in use, 90% said they would stick with Amdahl for their next large-scale Amdahl cpu upgrade; among Amdahl sites without the feature in use or planned for 1987-88, 43% said they would switch back to IBM. Luckily for Amdahl, the share of its users with the multioperating system feature installed is projected to rise to 55% by the end of next year, from 24% now.

IBM Slipping in Drives Category

Planned installations of peripherals for IBM users were found to be up only slightly from the year before. About 44% of the respondents planned to add disk drives (up from about 41% the year before), 20% planning additional tape drives (up from 19% last year), and 41% planning additional terminals, up from 40%.

In disk drives, a prime contributor to IBM's bottom line, the industry leader's position seems to be slipping a bit. IBM's share of the installed base looks stronger than in its share of planned acquisitions for the upcoming 24 months, as plug-compatible manufacturers boost shipments of their 3380-type products. IBM controls 79% of the mainframe disk drives that respondents have installed (including 3380s and smaller drives), but it stands to gain only 74% of their future orders.

Big Blue's loss appears to be largely StorageTek's gain: the Louisville, Colo.-based company's share of all installed drives was measured at 7%, but the company will get 10% of the future disk drive orders. NAS, too, will enjoy an increase, to 4% of the upcoming orders, up from 3% of the installed base. Amdahl and Memorex, however, will show a decline,

FIGURE 4 **Users Want Faster 3090 Channels**

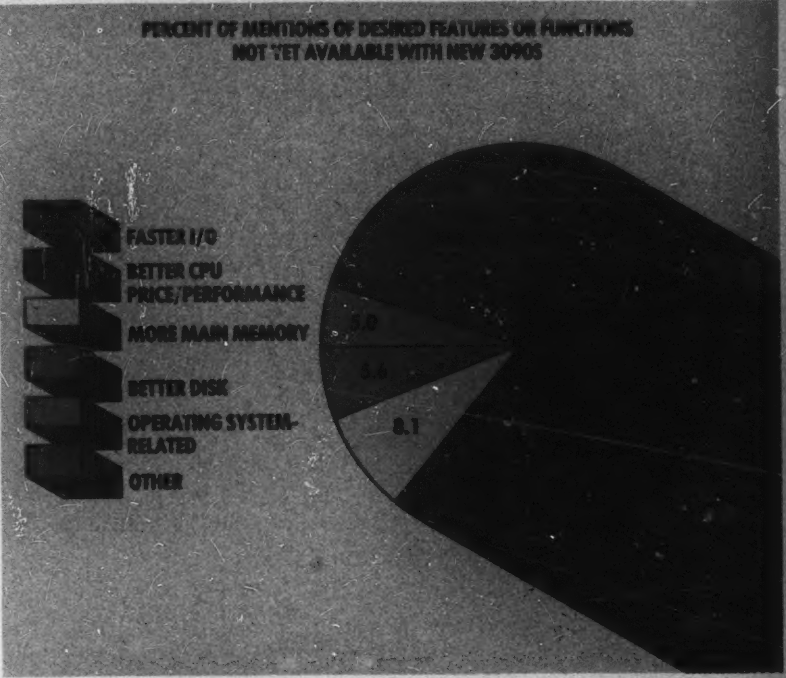
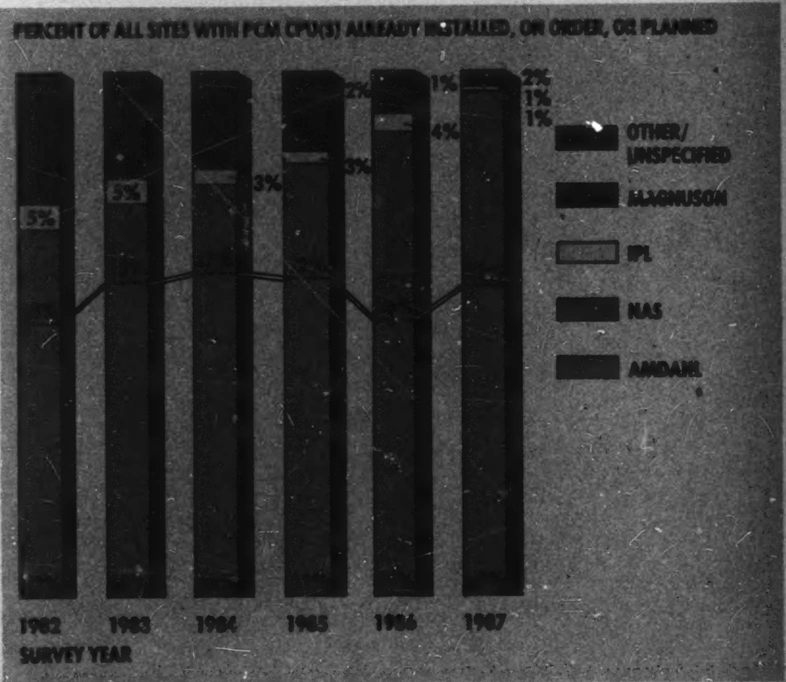


FIGURE 5 **Amdahl Gains Pcm Market Share**



to 2% and 1%, respectively, from 4% and 3%.

IBM's share of the 3380 market appears to be dropping significantly, even though respondents said they would acquire more 3380E double-capacity models than single-capacity drives. While last year they said they would get 86% of their 3380 units from IBM during the following 24 months, this year the comparable figure is only 77%. StorageTek's comparable 3380 share rose to 9% this year, from 5% last year. (In the non-3380 disk arena, where IBM's share of planned procurements is holding firm at around 63%, StorageTek will grow to 17% of planned shipments this year, from only 11% a year ago.)

The survey showed a diminished need for disk capacity among IBM and compatible sites. While 72% of the large-scale (308X/3090) sites last year said they needed more capacity, this year's figure was only 65%. Among 4300-class sites, the 1986 and 1987 figures were 55.7% and 54.4%, respectively. System/3X sites, however, showed a slight increase, to 43.9% this year from 42% in 1986.

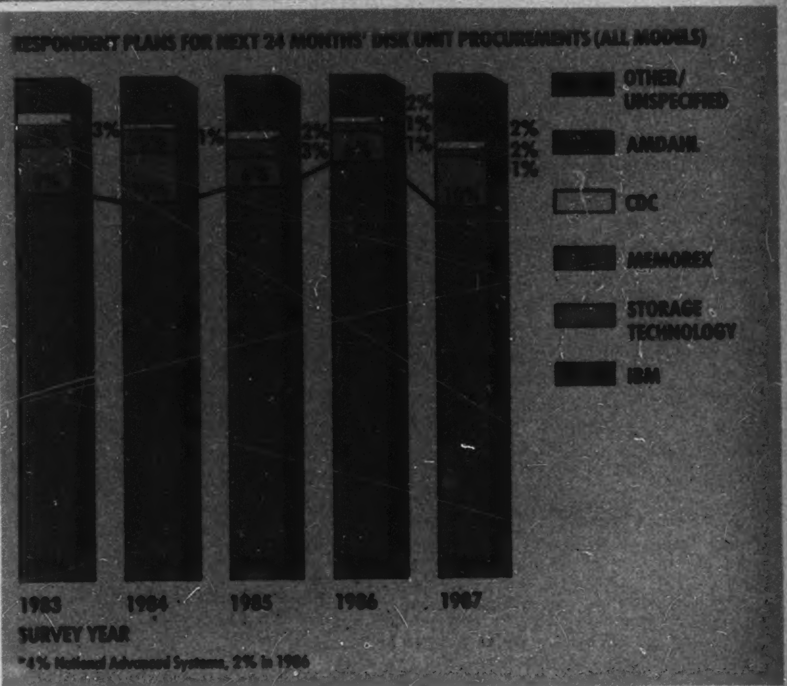
IBM's share of the tape drive market, buoyed by its 3480 model, continues to rise. Last year, respondents said they'd get 65% of their tape drives from Big Blue; this year, that number is up to 73%. StorageTek, too, will enjoy an increase, to 16% this year from 14% in 1986.

In the crt terminals area, IBM remains dominant, with 67% of planned procurements, up from 59% a year earlier. ITT-Courier and Telex's comparable shares each seem to be dropping to 8% this year, down from 10% in 1986. In contrast, Memorex is enjoying a slight increase to 7% this year, from 5% in 1986.

While IBM had seemed to lose share in the DBMS market in previous surveys, its DB2 package is now coming on like gangbusters. At the time of the survey, IBM sites of all sizes indicated that 5% of their installed DBMS packages were SQL, 6% were DB2, 11% were DL/1, and 17% were IMS. As for planned installations, however, the comparable figures were 15%, 29%, 2%, and 4%, respectively. Among large-scale sites, DB2's share is even more impressive: a whopping 59% of planned installations, up from 10% currently installed.

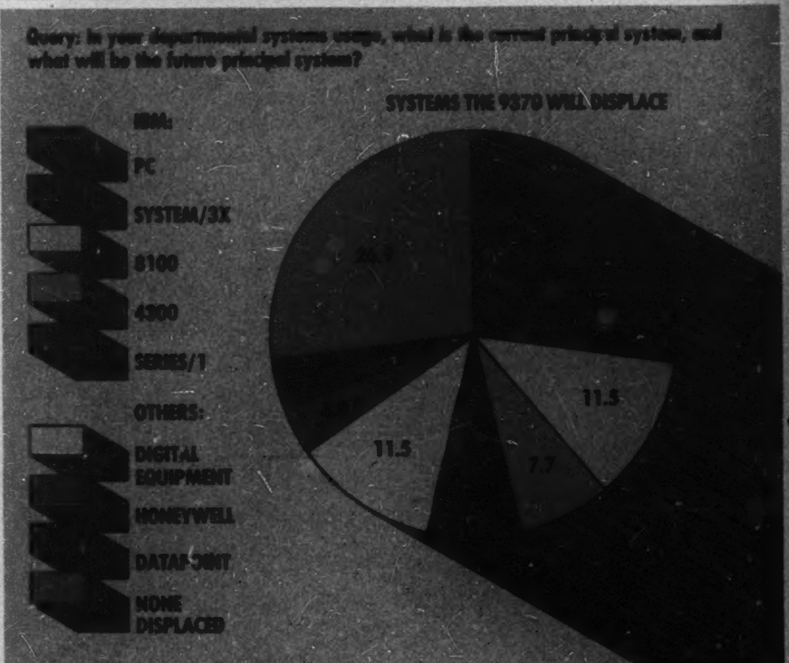
Needless to say, IBM's rebound in the DBMS market is squeezing independents severely. Cullinet, for instance, garnered 16% of the current installations

FIGURE 6 IBM Slips in Large Disk Share



*4% National Advanced Systems, 2% in 1986

FIGURE 7 9370 to Affect IBM Systems More Than Others



but stands to get only 9% of the future buys. Among large sites, Cullinet's share will fall to 6% planned from 18% installed.

But IBM is only holding the line in the 4300-class sites, where even though SQL is moving to 24% planned from 10% installed, the company's total share remains at 41%. Cullinet will drop to 10% planned from 16% installed; Software AG to 8% planned from 9% installed. Applied Data Research, however, will improve slightly, to 12% planned from 10% installed.

Attitude on Burroughs Improves

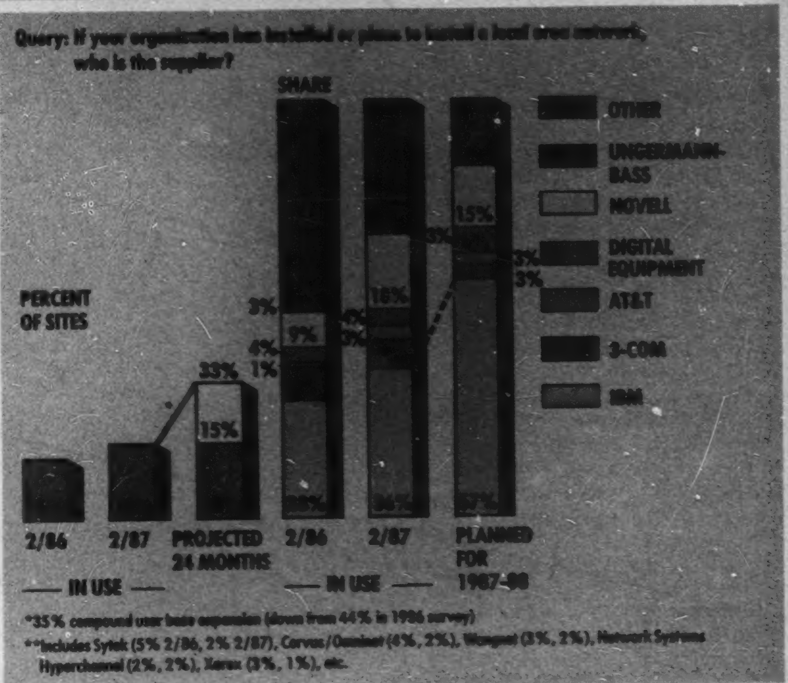
Perhaps the biggest event in 1986 for the computer industry was the creation of Unisys Corp., through Burroughs' acquisition of Sperry. Naturally, the big question is how well Unisys can manage its two constituencies' disparate, and possibly conflicting, needs. In general, users of Burroughs gear viewed the merger as affecting their buying decisions quite positively, but high-end Sperry 1100 sites saw it having a negative effect. Given that Sperry initially resisted Burroughs' acquisition move, this latter reaction may simply be an emotional one. There is little sign of potential defections among those disgruntled 1100 sites, even though delivery of compatible follow-on systems may be stretched out.

As with the other non-IBM-compatible suppliers, both Burroughs and Sperry users said that the area needing most attention from their respective vendor was applications software. However, overall ratings improved from the year before, more for Burroughs than for Sperry sites.

Unisys respondents said they planned to install equipment in 1987-88 that will be worth 25% of the value of their current installed base. That compares favorably with the 20% figure derived from last year's survey. For Burroughs sites alone, the comparable figure was 31% extra value to be added, up from 23% a year before; for Sperry sites, it was 20% this year, compared with 17% before.

The need for additional mainframe capacity among Burroughs sites was down this year to 29% of the sites, from 35% last year. Among Sperry sites, the comparable figures were 27% this year compared with 31% last year. A need for extra disk capacity was indicated by 39% of the Burroughs sites, down from 44% in the 1986 survey, and by 45% of the Sperry sites, down from 50%.

FIGURE 8 **Novell Gains with IBM in LAN Market**



*35% compound user base expansion (down from 44% in 1986 survey)

**Includes Sytek (5% 2/86, 2% 2/87), Corvus/Omninet (4%, 2%), Wangnet (3%, 2%), Network Systems Hyperchannel (2%, 2%), Xerox (3%, 1%), etc.

The Burroughs sites showing the most demand for extra mainframe capacity were not those among its commercial breadwinners—manufacturing, wholesale/retail, and financial institutions—but rather the education and civilian government sectors. Among Sperry sites, the strongest demand is to be found in national defense and communications utility sites.

Add-on peripherals activity plans among Unisys sites was found to be flat or down compared with those of last year. Only slight increases were found in terminals, while the important disk business was down sharply in both camps. The percentage of respondents buying from Unisys is up, however, at the expense of pcms. Sperry was found to be doing quite well with its personal computers, with 57% of its respondents having standardized on its machines and 20% on IBM's. Among Burroughs sites, the comparable figures are 31% for Burroughs and 35% for IBM.

Boost for Honeywell

As for Honeywell, after two extremely slow years, planned installation activity among its user base has gotten a substantial shot in the arm. While last year these users said they would install equipment that was worth 10% of the value of their installed base during the following two years, they indicated a comparable figure of 17% this year. However, only half the percentage of those users (22% this year compared with 44% last year) said that they planned to add disk drives.

The percentage of Honeywell sites needing more mainframe capacity remained just about flat, at 34%, up from 32% in 1986. A similar situation was found in the need for disk capacity (49% needing it this year, compared to 50% last year). Just over a fifth (23%) of the respondents said they planned to add disk drives, while exactly a third said they planned to add crt terminals.

On the distributed processing front, Honeywell users seem to lead the industry: 43% of them are currently involved with that technology, while 58% will be so by the end of next year. However, a relatively tiny fraction of the Honeywell base (7%) said it had standardized on Honeywell personal computers. This compares poorly with, for instance, Sperry's figure of 57%, and represents a vulnerability to other vendors, namely

IBM. Similarly, only a third or so of the Honeywell sites said they had chosen that firm as the main supplier of office systems.

Nevertheless, there was a general improvement in Honeywell respondents' attitude toward the vendor, with the strongest negative factor continuing to be applications software. The company has gained substantial favor for its field maintenance services, however.

NCR user respondents indicated an overall improvement in their attitude toward the vendor, but showed continuing weak marks for the company's database and applications software offerings. As a whole, planned installation activity was up substantially compared with the year before. NCR customers said that during 1987-88 they would add equipment worth 21% of the value of their current installed base; last year's figure was only 13%. In terms of units, those planned installations would be equivalent to 17% of the installed base, down slightly from the 16% registered last year.

In terms of already installed capacity for 1987-88, a quarter of the NCR sites said they needed more mainframe capacity. NCR's important financial institution customers showed the least need for system capacity. Business services, manufacturing, and wholesale/retail services also have more than enough capacity on hand. A third of the NCR sites said they needed to—and would—add disk drive capacity; the strongest demand came from users of large V8XXX mainframes. A third of all NCR respondents indicated plans to add crt terminals.

But users of the small V8XXX machines showed a strong leaning toward leaving the NCR fold sometime in the future: one out of four such users said they would do so, up from one out of 10 a year ago.

An important product line for NCR has been its Tower systems, based on the 32-bit Motorola 68000 microprocessor. Thirty percent of the large V8XXX respondents already have installed such machines, with another 10% planning to do so. While only 19% of the large NCR sites were currently involved with distributed processing, 43% said they would be by the end of next year.

Each year this survey measures customer loyalties, and this year's poll found sharp increases in the portion of large-scale (i.e., the most important) Honeywell and NCR users who are "seriously considering a change" of primary vendor. Last year, only 20% of such Honeywell sites and 4% of NCR sites fit into that category, but this year the comparable figures are 31% and 13%. Burroughs and Sperry users came in this year at 15% and 17%, respectively up slightly from 14% each last year.

Survey Method

The 1987 DATAMATION/Cowen & Co. Computer and Telecommunications Survey, the 10th to be conducted by the two organizations, began Jan. 12 when some 55,000 questionnaires were mailed to mainframe users across the U.S. and Canada. As in previous years, both general and vendor-specific questions were asked in an attempt to gauge users' attitudes toward their vendors and to project user spending plans.

By late February, a total of 3,919 qualified, unduplicated responses were in hand and ready for tallying. Of those, 2,800 were from IBM sites, 438 from Burroughs sites, 221 from Honeywell sites, 221 from NCR sites, and 239 from Sperry sites. The respondents come from all sectors of the economy: manufacturing, wholesale/retail, banking, insurance, business services, education, government, and others. Annual revenues or budgets for the sites range from under $25 million to over $500 million.

After IBM unveiled its 3090 Model E mainframes in late January, a second questionnaire was sent to almost 500 relevant sites to determine what their reaction to the new machines was. Some 320 responses were received and tallied.

In analyzing the survey data—of which only a small fraction is portrayed in this article—one should keep in mind that they reflect the economic environment at a fixed point in time. Thus, the survey cannot anticipate the effects of subsequent products or pricing changes.

To order the complete survey results, please call Laurie Schnepf at (212) 605-9726.

Digital World Seen as Attractive

As usual, most of those potentially migrating large users (59%) indicated the IBM 370 world as their most likely option, but Digital, at 22%, was mentioned as a strong candidate too. Among small systems sites that might make such a move, Digital scored even higher (28%), compared with IBM's 44%. Hewlett-Packard's score in this respect continued to shrink, down to 8% of small users this year from 11% in 1985.

Price/performance remains the key issue for those non-IBM sites that are seriously considering a switch of vendors, which means that to remain competitive, the BUNCH suppliers must keep up with each other and IBM. Of those likely to switch vendors, 58% said their current vendors' systems offered "inferior" price/performance; 27% ranked their vendor as average.

For the non-IBM sites as a whole, the availability of applications software is again the most cited area needing vendor attention. Third-party vendors may be coming to the rescue, however, for in all categories except Honeywell, fewer users this year than last ranked outside-supplied applications packages as being "below average."

Turning to communications, the survey found that non-IBM sites are planning further connections into networks based on IBM's de facto standard Systems Network Architecture. Among large Sperry, Burroughs, Honeywell, and NCR sites, respectively, 6%, 1%, 9%, and 1% said they were already using SNA connections. But current plans call for those figures to grow to 9%, 9%, 17%, and 14%, respectively, in the following two years. Proprietary network architectures were in use or planned at 30%, 32%, 41%, and 4% of those same large sites.

However one defines it, distributed processing gains importance each year. This year's poll projects an 18% compound growth rate for that type of computing, with 39% of the sites involved at the time of the survey and a total of 54% planning to be so by the end of next year. There appears to be an interesting shift away from personal computers in departmental computing and toward minicomputers. Of the planned departmental systems cited by IBM sites, 39.6% were to use pcs (down from 45.6% of those already installed), while a less-than-overwhelming 17.4% were to use the new 9370 midrange processor. System/3X machines were to hold steady at about 36%. ■

Companies are simply not meeting the computer training needs of their end-user employees, a recent survey shows. Self-training was found to be the dominant mode of learning among 100 users surveyed at 20 large and medium-sized companies. Top management needs to become more aware of just how important organizational learning is to the successful development of a corporation. Training budgets that represent 1% to 2% of the information systems budget are too small to support yesterday's educational needs, let alone today's.

Training Today's User

BY R. RYAN NELSON
AND PAUL H. CHENEY

In today's corporation, training is not a trendy topic. Often, it's not a topic at all. Disavowing any formal role in the educational process, many companies have left dp training of the operational staff up to the individual end user.

A recent survey of 100 users in 20 large and medium-sized corporations shows that companies simply are not meeting the computer training needs of their end-user employees. In many of these firms, technology, not training in technology, gets the highest priority.

Why is this so? The manager of information support at Durham Life Insurance Co., Durham, N.C., candidly explains, "It is purely a financial reason. . . . When you buy a piece of hardware, you capitalize it and depreciate it over a five-year period. In other words, the philosophy is that hardware is free. Furthermore, hardware is not going to get sick, strike, or quit."

TRAINING IS OFTEN LEFT UP TO THE END USER.

The quitting scenario is one that really scares some companies that shy away from training. "We've just purchased a $2 million computer and that decision was made in a one-hour meeting," says Durham Life's dp boss. "On the other hand, I've been through three separate hour-long meetings over whether or not we were going to spend several thousand dollars training somebody in a leading-edge technology only to lose him to some other company."

The first step in meeting a company's end-user training needs is to determine those needs. This can be accomplished by questioning the employees themselves. They know their own dp skill levels and the type of reports they have to furnish. One way to find out those skill levels is through diagnostic tools such as a questionnaire that rates employees' computer-related abilities.

To see how this works in practice, a questionnaire was administered to the 100 users surveyed. The objectives were to determine individual abilities and to see how important each person felt the different dp skills were to his or her job performance. These users reported they had the most ability in understanding and interpreting output, accessing data, and using hardware; their skills were lacking in programming, model building, and the ability to use graphics techniques. Deficiencies in the model-building area can have a negative impact on the development of decision support applications.

Items from this basic-abilities questionnaire can be modified or deleted as new dp skills or technologies become integrated into the organization. After administering the questionnaire on a periodic basis, organizations should take steps to remedy the shortfall in skills. A seminar on modeling techniques, for example, would be appropriate for most of the 100 survey participants.

Using Outside Reviewers

There are other approaches that can help an organization assess its dp training needs. One company recommended bringing in outside consultants to review the performance of the information systems area, including computer-related training programs. Another firm reported that at its annual meeting, operating managers are asked to pin-

FIGURE 1 Rating and Ranking Computer Abilities

ABILITY TO:	PERCEIVED IMPORTANCE RANK	PERCEIVED IMPORTANCE MEAN RATING*	CURRENT ABILITY LEVEL RANK	CURRENT ABILITY LEVEL MEAN RATING*
Understand/interpret output	1	3.86	1	4.41
Access data	2	3.00	2	3.46
Use hardware	3	2.79	3	3.30
Use packaged application software	4	2.63	4	3.20
Use application development software	6	2.14	5	3.10
Use operating systems	5	2.40	6	2.58
Handle data communications	8	2.03	7	2.48
Use graphics techniques	11	1.95	8	2.45
Use office automation systems	7	2.06	9	2.40
Build models	10	1.96	10	2.34
Program	9	1.97	11	2.12

*1 = low, 5 = high

FIGURE 2 Sources of Computer Training

(FREQUENCY/PERCENT)

TRAINING SOURCE	NONE	SLIGHT	MODERATE	SUBSTANTIAL	GREAT	VERY GREAT	MEAN*
Self	8	31	17	15	20	9	3.35
College	37	26	27	5	5	0	2.15
Company	25	32	15	14	9	5	2.65
Vendor	43	24	19	7	5	2	2.13
Other	85	5	8	1	1	0	1.28

*1 = low, 5 = high

point the troubles they've had with service departments, including dp. During this brainstorming session, managers identify their problems and then state their solutions.

Most companies never seem to get to this needs assessment stage. Generally speaking, top management needs to become more aware of just how important organizational learning is to the successful development of a corporation. Resources need to be devoted to R&D activities aimed not only at the corporate product or service, but also at the corporate employee. Training budgets that represent 1% to 2% of the information systems budget are too small to support yesterday's needs, let alone today's.

The end users surveyed were also asked about the sources of their computer-related training. Self-training was found to be the dominant source of training. Many of the managers described the amount of their computer education as only slight to moderate. More specifically, 80% said they had received none, slight, or moderate training in the five categories listed.

Certain types of training turned out to be useful in building particular computer abilities. College training tended to be most valuable in developing an employee's ability to program, model, and use graphics facilities, and for learning specific applications development packages such as Lotus 1-2-3 and dBase III.

Not surprisingly, vendor training proved especially helpful in educating managers in the use of specific applications software packages and in the other, more proprietary realms of data communications and hardware concepts. Meanwhile, self-training enhanced most of the skill areas, including use of packaged software, data communications, graphics capabilities, and databases.

Training Increases Abilities

A total of seven different training techniques were used among the 20 companies surveyed. They included tutorials; courses, lectures, or seminars; program instruction/computer-assisted instruction; interactive training manuals; resident experts; help components embedded in end-user information systems; and education conducted outside the company, such as college courses.

The managerial end users rated each technique in terms of quantity and quality. The average amount of training time received by each user since beginning his or her employment at the firm ranged from 7.82 hours for the interactive training manual method to 104.82 hours for the resident expert approach. Of the 100 managers, 74 did not have any experience with help components.

The survey indicated that training increased the computer abilities of managers as well as their direct use of dp systems in their organizations. Users were more satisfied using technology tools when they were adequately trained.

The tutorial technique was the most effective in terms of educating end users about packaged applications software. Programmed instruction and computer-assisted instruction were better for teaching office automation skills.

Most of the companies surveyed were not meeting the computer training requirements of their employees, who ended up teaching themselves the dp skills they needed. To put training on the right track, corporations need to invest more in their computer education programs. One to two trainers for a firm with over 100,000 employees is simply not enough.

It may be necessary to bring in training specialists from the vendor or consulting community to assist in these educational efforts. Self-training is all right as long as it is adequately supported by in-house experts, help components, programmed or computer-assisted instruction modules, tutorials, and in some cases, an interactive training manual.

Companies also should have better communication with colleges and universities, keeping them up-to-date on the computer-related skill requirements they desire for both their technical and nontechnical employees. Industry advisory boards can often serve as useful go-betweens in this process. Even more important is internal communication. Organizations should look for every possible opportunity to bring the information system staff together with operating personnel to exchange information and increase understanding. ■

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DATAMATION

JUNE 15, 1987
A CAHNERS PUBLICATION
OEM EDITION

SPECIAL REPORT

The Datamation 100

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DATAMAT

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For the top companies in the dp industry, 1986 contained a pinch of this and a dash of that: revenues went up, profits went down, but fewer companies lost money. The industry employed fewer people, while the falling dollar played a key role in the ascent of many companies' fortunes. For the world's top 100 computer companies, the till rang up $176.9 billion, an increase of 17% over 1985's total.

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Unisys debuts at number two; for the first time, two nonhardware-focused, nonmultinational Japanese companies make the list. Oh, and IBM is number one.

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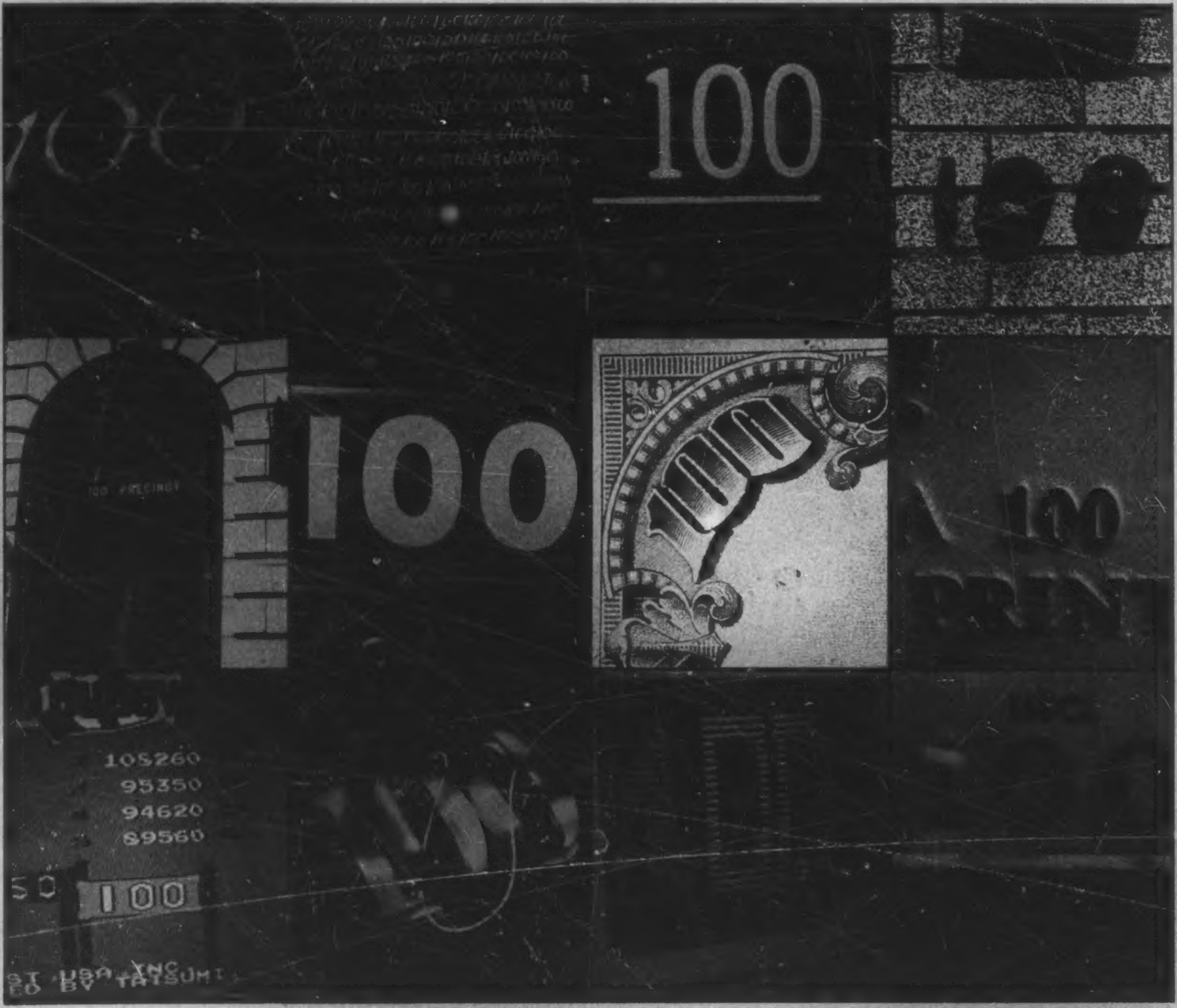

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OEM EDITION 158-1

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-1 **Unix: Window of Opportunity?**
BY ANN LALLANDE
If Unix played the numbers, it would put its money on 386. That's the chip that some feel will make the operating system a big wheel in the computer world, although it still must do battle with an image of hostility to the average user.

Cover photographs by Paige Buffington, Steve Cooper, Lucien Flotte, James Joern, Michael Marks, Michael F. Nied, and Peter Angelo Simon

This issue marks the last in which the oem section will appear.

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Editorial

Industry Approaches $200 Billion Mark

Once upon a time, the rankings of the DATAMATION 100 changed little from year to year. Of course, as recently as five years ago, we were taking a pretty settled view of the world of data processing: the rankings were of U.S.-based companies only. Oh, Burroughs and Sperry would do-si-do in the fifth and sixth positions year after year. And, just five years ago in these pages, Digital Equipment Corp. managed to climb to the second rung of the dp ladder from the fourth, propelled by a hefty 30.7% growth in dp revenues for 1981 over 1980. In that same 1982 survey, IBM's dp revenues were up just 16.7%.

The top 10 companies were usually the same. You could count on IBM, DEC, CDC, NCR, Burroughs, Sperry, HP, Honeywell, and Xerox. (Vying for the 10th spot were Wang, Memorex, and StorageTek.) The 1982 DATAMATION 100 revealed that total revenues of those U.S.-based winners grew to $67.8 billion in 1981 from $55.6 billion in 1980—a healthy 21.9% increase.

Now we invite you in for a look at our 1987 DATAMATION 100, where dp revenues for the 100 chartbusters from around the world top $176.9 billion in U.S. dollars. That represents a 17% increase over dp revenues of last year's DATAMATION 100 winners.

As we now view data processing through global glasses, our line-up is a far cry from that of our survey just five years ago. For one thing, fully half of the top 10 companies are based outside the U.S. And no longer do Burroughs and Sperry jockey for position; united in Unisys, they combine to earn the second position in rank, bumping DEC to third.

So where is that slump we talked about all last year? Clearly, the slump was in the U.S. dollar. Because the DATAMATION 100 rankings are based on worldwide dp revenues translated into dollar values, a company based, for example, in Japan could easily boost its ranking in our survey by the sheer buying power of the yen. Toshiba's dp revenues, for instance, rose a respectable 15% when measured in yen; translated into dollar values, revenues soared 62%. Toshiba's ranking was elevated nicely too—from the 21st position to the lucky 13th spot.

Welcome to the world of data processing; it's a big world after all. We estimate that the dp revenues of the DATAMATION 100 represent 90% of total worldwide dp revenues, which, at $196.5 billion, means the industry is closing in on the $200 billion mark. ■

REBECCA S. BARNA
EDITOR

The Datam

A DATAMATION STAFF REPORT

Ask what happened to the companies in the DATAMATION 100 last year, and fingers start pointing in every imaginable direction. Companies collapsed and blossomed; the dollar dimmed, helping and hurting; some markets cooled, while others heated up. For the top 100 companies in the dp business, total dp revenues were up handsomely to $176.9 billion, 17% over the total dp revenues of last year's DATAMATION 100.

Pointing in the other direction, total corporate profits of the companies on the roster headed down 4% to $25.7 billion. The chief culprit behind the profit picture was IBM. Earnings at Big Blue, which make up nearly a fifth of the total profits of the DATAMATION 100, fell 27% in 1986. (Remember also that many of the companies on the DATAMATION 100 are in more businesses than just dp: the figures for total profits are derived from total corporate revenues of parent companies, not just their dp entities. So the profits of a thriving dp operation—like EDS—are diminished by those of a sickly corporate parent—like GM.)

The companies that actually reported 1986 losses managed to tally up a large and depressing number. Twelve companies ended up in the red, ranging from Control Data's big $264.5 million loss to Computervision's $5.8 million. The total for the dirty dozen big losers: a whopping $655.2 million down the tubes.

And the dollar? It went thataway, its fall during 1986 altering the population of the top 100 companies, sending some companies soaring, shouldering others off the list entirely. For example, look at some Japanese companies. Because the DATAMATION 100 rankings are based on worldwide dp revenues translated into dollar values, a company headquartered in Japan could buy more cheap dollars with fewer yen. Toshiba's dp revenues were up 15% when measured in yen, but they skyrocket 62% when translated into dollars, elevating the company to rank 13 in this year's DATAMATION 100, up from 21 last year.

Still, the sagging greenback supported a lot of U.S. companies, particularly the biggest one. IBM's U.S. revenues were down by 11%, while its non-U.S. revenues were up 20%. In fact, IBM's U.S. business was down in every product category except software and maintenance. Foreign currency translations, however, raised foreign revenues to $4.37 billion, according to Bob Djurdjevic of Annex Research, Phoenix. Without a boost from the dollar's slump,

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It was a year of mixed results for the top companies in the dp industry. Revenues were up but fewer people had jobs. Profits were down, but fewer companies lost money. The falling dollar rearranged the ranking of the DATAMATION 100, moving some non-U.S.-based companies up the chart. Some U.S. multinationals also got a boost from the trials of the greenback.

IBM's 1986 revenues might have been down 6.3% instead of being up 2.3%.

But IBM's troubles are not necessarily contagious. The overall increase in dp revenues of about 17% for the DATAMATION 100 indicates that while IBM may be feeling peaked, there are plenty of robust companies in the industry. Things may still be tough, but companies with the right products, good timing of product cycles, and good management are proving that healthy sales are attainable.

Profiting from these sales is apparently more difficult. In 1984, 17 of the companies on the DATAMATION 100 had net profits that were 10% or more of total revenues. In 1985, that count fell to nine.

Last year, the number of 10-percenters stayed at that level. Still, there were some bright spots. Two companies shot over 20%, one of them newcomer to the list Microsoft, the other a longtime hot earner, Cray Research. Digital Equipment Corp.—the company that could do no wrong in 1986—also joined this happy group of overachievers, scoring profits of 10.24% of revenues. IBM, which had earned 13% of sales in 1985, could do no better last year than 9.34%. Still, that return on revenues put IBM ahead of all but 10 of the DATAMATION 100.

Belt-tightening was evident throughout the DATAMATION 100, most notably in personnel. At the end of 1986, the companies on the list employed a total of 6.63 million people, about 13,000 fewer than in 1985. With total sales up 17%, it is obvious that a lot of companies are finding they can sell more with fewer people.

Some companies cut staff severely. Among them was AT&T, which in December 1986 employed 26,600 fewer employees in all divisions than in December 1985. At the other end of the scale, Apple, having done most of its personnel surgery in 1985—when it cut its staff by 22%—was in the hiring mode again, growing by 42% to 5,940 by the end of 1986. In fact, Apple's hiring made the company 10% bigger than it had been in 1984, the most recent dp boom year.

Of the 10 top hirers (ranked by percent increase in total staff), three companies are primarily in the peripherals business, two are in software, two primarily in computer services, and there is one each in minicomputers, supercomputers, and microcomputers. Also boasting big percentage increases in staff size were the leasing company Comdisco, up 22% to 930 employees, and Olivetti, whose 21% increase to 59,091 was helped by some acquisitions. It seems no mere coincidence that most of the companies whose staffs increased markedly during 1986 concentrate on specific markets.

Likewise, in this year of contrasts, the companies that shrank most appear to be victims of diffuse strategies: Control Data Corp., AT&T, and Tektronix. Some of the other 1986 downsizers did so in order to focus their efforts: Gould and Harris both reorganized during the year. And some companies fell victim to overdependence on single, fickle oem customers, notably Convergent with AT&T.

Another company issuing fewer paychecks by the end of 1986 was IBM. While it employed only 2,027 fewer employees than in 1985, the turnaround marked the end of long, steady growth at the industry leader. For example, in 1981, IBM employed 354,936; in 1982, that number grew to 364,796; in 1983,

FIGURE 1 The Markets of the DATAMATION 100

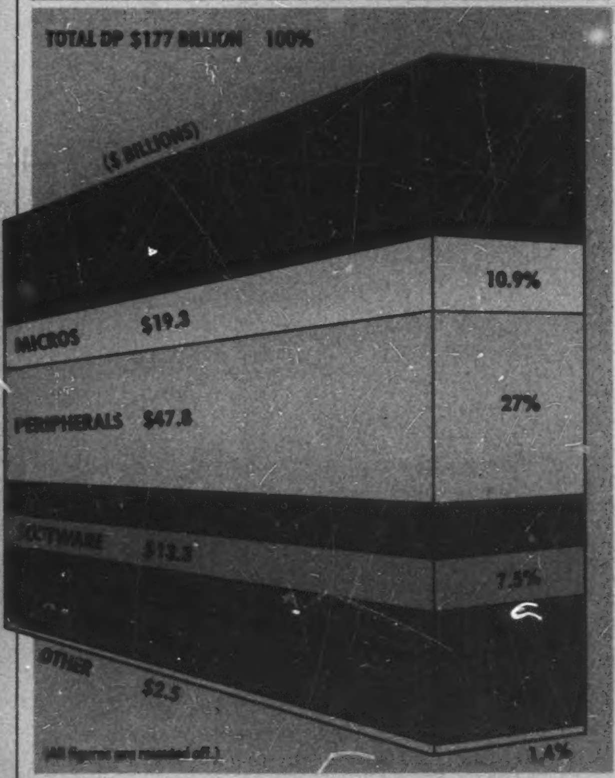


FIGURE 2 The Top 15 in Mainframes

	DTM 100 RANK	COMPANY	1986 ($ MIL.)	1985 ($ MIL.)	$ % CHANGE*
1	1	IBM	14,450.0	14,010.0	3.1
2	4	Fujitsu Ltd.	2,469.7	1,618.6	52.6
3	5	NEC Corp.	2,274.9	1,216.6	87.0
4	2	Unisys Corp.	2,200.0	NA	NA
5	6	Hitachi Ltd.	1,371.4	836.8	63.9
6	[illegible]	Groupe Bull	821.9	574.3	43.1
7	20	Honeywell Inc.	740.0	775.0	-4.5
8	8	Siemens AG	582.9	374.1	55.8
9	56	Cray Research Inc.	525.5	332.6	58.0
10	36	Amdahl Corp.	497.6	434.0	14.7
11	22	STC plc	486.0	370.0	31.4
12	11	Control Data Corp.	400.0	531.0	-24.7
13	49	National Semiconductor	300.0	270.0	11.1
14	60	BASF	276.5	196.4	40.8
15	25	Mitsubishi Electric Corp.	184.6	130.7	41.2

■ Amid mixed signals Amdahl and National Semiconductor posted strong results in the final two quarters of the year.

*In local currency, Fujitsu's mainframe revenues were up 8% to ¥416.2 billion; NEC's were up 32.4% to ¥383.36 billion; Hitachi's were up 16% to ¥231.11 billion; Groupe Bull's were up 10.5% to FF5.69 billion; Siemens' were up 15% to DM1.27 billion; STC's were up 14.5% to £330.5 million; BASF's were up 3.9% to DM620 million; and Mitsubishi's were flat at ¥31.12 billion. NA: not applicable.

FIGURE 3 The Top 15 in Minis

	DTM 100 RANK	COMPANY	1986 ($ MIL.)	1985 ($ MIL.)	$ % CHANGE*
1	1	**IBM**	3,000.0	3,500.0	-14.3
2	3	**Digital Equipment Corp.**	2,000.0	1,600.0	25.0
3	7	**Hewlett-Packard Co.**	1,100.0	1,050.0	4.8
4	12	**Wang Laboratories Inc.**	804.7	786.0	2.4
5	13	**Toshiba Corp.**	765.5	499.8	53.2
6	4	**Fujitsu Ltd.**	620.2	439.0	41.3
7	2	**Unisys Corp.**	600.0	NA	NA
8	10	**Olivetti SpA**	492.5	348.6	41.3
9	25	**Mitsubishi Electric Corp.**	474.7	326.6	45.4
10	28	**Data General Corp.**	450.1	479.8	-6.2
11	17	**Nixdorf Computer AG**	414.7	407.9	1.7
12	9	**NCR Corp.**	366.5	357.0	2.7
13	75	**Norsk Data AS**	349.1	219.8	58.8
14	44	**Tandem Computers Inc.**	345.5	317.3	8.9
15	21	**Philips**	322.4	312.0	3.3

■ **DEC's mini year was unforgettable, but missing from this year's list of mini market leaders is its Massachusetts neighbor, Prime.**

*In local currency, Toshiba's mini revenues were up 8.4% to ¥129 billion; Fujitsu's were flat at ¥104.52 billion; Olivetti's were up 5.5% to L735.1 billion; Mitsubishi's were up 2.9% to ¥79.99 billion; Nixdorf's were down 25% to DM900 million; Norsk Data's were up 36.7% to NOK2.58 billion; and Philips' were down 23.8% to G790 million. NA: not applicable.

FIGURE 4 The Top 15 in Micros

	DTM 100 RANK	COMPANY	1986 ($ MIL.)	1985 ($ MIL.)	$ % CHANGE*
1	1	**IBM**	5,650.0	5,500.0	2.7
2	18	**Apple Computer Inc.**	1,781.0	1,603.0	11.1
3	10	**Olivetti SpA**	1,267.6	884.5	43.3
4	24	**Tandy Corp.**	997.0	796.8	25.1
5	2	**Unisys Corp.**	800.0	NA	NA
6	5	**NEC Corp.**	697.3	338.6	105.9
7	54	**Compaq Computer Corp.**	625.2	503.9	24.1
8	16	**AT&T**	600.0	500.0	20.0
9	13	**Toshiba Corp.**	581.5	289.8	100.7
10	58	**Zenith Electronics Corp.**	548.0	352.0	55.7
11	46	**Commodore Int'l Ltd.**	525.0	400.0	31.3
12	7	**Hewlett-Packard Co.**	450.0	400.0	12.5
13	15	**Xerox Corp.**	400.0	344.0	16.3
14	19	**Matsushita Elec. Industr.**	363.1	270.6	34.2
15	4	**Fujitsu Ltd.**	339.8	160.4	111.9

■ **Apple's strong growth followed a weak 1985 in which micro sales had fallen 8.2%. Commodore continues to suffer from management chaos. Zenith makes a big move in micros.**

*In local currency, Olivetti's micro revenues were up 7% to L1.892 trillion; NEC's were up 45.8% to ¥117.5 billion; Toshiba's were up 42% to ¥98 billion; Matsushita's were down 5% to ¥61.19 billion; and Fujitsu's were up 50% to ¥57.27 billion. NA: not applicable.

FIGURE 5 The Top 15 in Software

	DTM 100 RANK	COMPANY	1986 ($ MIL.)	1985 ($ MIL.)	$ % CHANGE*
1	1	**IBM**	5,514.0	4,165.0	32.4
2	2	**Unisys Corp.**	861.0	NA	NA
3	3	**Digital Equipment Corp.**	560.0	300.0	86.7
4	5	**NEC Corp.**	507.1	376.2	34.8
5	4	**Fujitsu Ltd.**	389.2	250.6	55.3
6	8	**Siemens AG**	387.1	221.1	75.1
7	7	**Hewlett-Packard Co.**	375.0	300.0	25.0
8	6	**Hitachi Ltd.**	331.0	202.0	63.9
9	17	**Nixdorf Computer AG**	299.5	192.0	56.0
10	89	**Lotus Dev. Corp.**	283.0	225.5	25.5
11	96	**Microsoft Corp.**	260.2	162.6	60.0
12	33	**Compagnie Gén. d'Elec.**	238.1	178.2	33.6
13	93	**Computer Assoc. Int'l**	226.5	143.7	57.6
14	10	**Olivetti SpA**	225.3	116.0	94.2
15	12	**Wang Laboratories Inc.**	200.0	157.0	27.4

■ **Microsoft and Computer Associates joined Lotus as the only software "pure plays" on the DATAMATION 100.**

*In local currency, NEC's software revenues were down 4.6% to ¥85.45 billion; Fujitsu's were up 10% to ¥65.59 billion; Siemens' were up 29.2% to DM840 million; Hitachi's were up 16% to ¥55.78 billion; CGE's were up 3% to FF1.65 billion; and Olivetti's were up 45% to L336.3 billion. NA: not applicable.

FIGURE 6 The Top 15 in Services

	DTM 100 RANK	COMPANY	1986 ($ MIL.)	1985 ($ MIL.)	$ % CHANGE*
1	23	**TRW Inc.**	1,450.0	1,275.0	13.7
2	27	**ADP Inc.**	1,298.1	1,102.1	17.8
3	31	**General Motors Corp.**	1,125.9	978.3	15.1
4	35	**Computer Sciences Corp.**	977.7	800.7	22.1
5	29	**McDonnell Douglas**	803.2	650.0	23.6
6	11	**Control Data Corp.**	752.0	1,058.7	-29.0
7	53	**Martin Marietta**	659.4	564.4	16.8
8	30	**Nippon Teleg. & Teleph.**	577.6	382.0	51.2
9	39	**General Electric Co.**	550.0	950.0	-42.1
10	59	**Arthur Andersen**	546.0	414.7	31.7
11	66	**Cap Gemini Sogeti**	419.9	245.1	71.3
12	9	**NCR Corp.**	350.0	300.0	16.7
13	84	**Boeing Co.**	300.0	270.0	11.1
14	1	**IBM**	300.0	300.0	NC
15	94	**Nomura Comp. Sys. Co.**	263.5	151.7	73.7

■ **The services sector is the only dp market in which IBM does not take the top slot. EDS is the muscle in General Motors' good showing in the segment.**

*In local currency, NTT's services revenues were up 7% to ¥97.33 billion; Cap Gemini Sogeti's were up 32.3% to FF2.91 billion; and Nomura's were up 23% to ¥44.41 billion. NC: no change.

FIGURE 7 The Top 10 in Peripherals

	DTM 100 RANK	COMPANY	1986 ($ MIL.)	1985 ($ MIL.)	$ % CHANGE*
1	1	**IBM**	11,264.0	12,676.0	-11.1
2	3	**Digital Equipment Corp.**	3,100.0	2,750.0	12.7
3	2	**Unisys Corp.**	2,500.0	NA	NA
4	6	**Hitachi Ltd.**	2,321.9	1,416.7	63.9
5	5	**NEC Corp.**	1,774.8	1,053.3	68.5
6	4	**Fujitsu Ltd.**	1,624.1	1,064.3	52.6
7	9	**NCR Corp.**	1,564.7	1,393.9	12.3
8	7	**Hewlett-Packard Co.**	1,525.0	1,373.0	11.1
9	11	**Control Data Corp.**	1,380.0	1,270.0	8.7
10	15	**Xerox Corp.**	1,300.0	1,265.0	2.8

■ **Control Data began a comeback in 1986, after a 1985 drop in peripherals sales. IBM's falling revenues were yet another symptom of troubled system sales.**

*In local currency, Hitachi's peripherals revenues were up 16% to ¥391.28 billion; NEC's were up 19.3% to ¥299.09 billion; and Fujitsu's were up 8% to ¥273.69 billion. NA: not applicable.

FIGURE 8 The Top 10 in Datacom

	DTM 100 RANK	COMPANY	1986 ($ MIL.)	1985 ($MIL.)	$ % CHANGE*
1	1	**IBM**	2,000.0	2,300.0	-13.0
2	8	**Siemens AG**	1,096.8	785.6	39.6
3	16	**AT&T**	1,075.0	1,050.0	2.4
4	38	**Northern Telecom Ltd.**	800.0	800.0	NC
5	5	**NEC Corp.**	748.0	443.9	68.5
6	13	**Toshiba Corp.**	534.1	378.0	41.3
7	4	**Fujitsu Ltd.**	531.0	375.8	41.3
8	33	**Compagnie Gén. d'Elec.**	523.5	378.8	38.2
9	26	**LM Ericsson**	519.7	476.8	9.0
10	19	**Matsushita Elec. Industr.**	478.5	365.2	31.0

■ **Mirroring the slowdown in computer sales, datacom sales were off at IBM, AT&T, and Northern Telecom.**

*In local currency, Siemens' datacom revenues were up 3% to DM2.38 billion; NEC's were up 19.3% to ¥126.05 billion; Toshiba's were flat at ¥90 billion; Fujitsu's were flat at ¥89.48 billion; CGE's were up 6.71% to FF3.63 billion; Ericsson's were down 9.8% to SKr3.7 billion; and Matsushita's were down 7.3% to ¥80.63 billion. NC: no change.

FIGURE 9 Growth Spurts

RANKED BY % INCREASE IN DP REVENUE

	DTM 100 RANK	COMPANY	DP REV. IN LOCAL CURRENCY (MIL.) 1986	1985	% INCREASE
1	57	**Lockheed Corp.**	$551.0	$113.3	386.3
2	50	**Seagate Technology**	$709.4	$303.6	133.7
3	76	**Sun Microsystems Inc.**	$341.1	$147.1	131.9
4	67	**Xidex Corp.**	$418.3	$232.8	79.7
5	65	**Atlantic Computers plc**	£293.1	£175.0	67.5
6	96	**Microsoft Corp.**	$260.2	$162.6	60.0
7	56	**Cray Research Inc.**	$596.7	$380.2	56.9
8	58	**Zenith Electronics Corp.**	$548.0	$352.0	55.7
9	93	**Computer Assoc. Int'l**	$264.9	$170.4	55.5
10	100	**Recognition Eqpt.**	$246.6	$163.1	51.2

■ **Lockheed bought its way onto this list acquiring Sanders Associates, number 71 on last year's DATAMATION 100.**

FIGURE 10 Falling Fortunes

RANKED BY % DECLINE IN DP REVENUE

	DTM 100 RANK	COMPANY	DP REV. IN LOCAL CURRENCY (MIL.) 1986	1985	% DECREASE
1	83	**Convergent Tech.**	$305.8	$459.3	33.4
2	42	**Oki Electric Ind.**	¥148,224.0	¥211,995.0	30.1
3	39	**General Electric Co.**	$900.0	$1,130.0	20.4
4	79	**Datapoint Corp.**	$325.0	$404.2	19.6
5	45	**C. Itoh & Co. Ltd.**	¥136,288.0	¥168,091.0	18.9
6	97	**3M**	$255.0	$295.4	13.7
7	26	**LM Ericsson**	SKr9,571.0	SKr10,561.0	9.4
8	11	**Control Data Corp.**	$3,346.7	$3,679.7	9.0
9	88	**Sony Corp.**	¥48,054.0	¥52,806.6	9.0
10	73	**Dataproducts Corp.**	$350.8	$370.6	5.3

■ **Almost half of Convergent's 1986 drop in business was a result of falling orders from big customer AT&T.**

employment was up to 369,545; in 1984, more than 25,000 were added, jumping total employment to 394,930; and in 1985, at its peak, IBM was paying 405,535 people. Last year, shrinking profits and flat sales decreed a slimmer behemoth in Armonk.

Nevertheless, growth and prosperity are present in the DATAMATION 100; Redmond, Wasn.-based Microsoft and Nomura Computer Systems and CSK Corp., both in Tokyo, are not the only debutants on this year's list. Other newcomers include Sun Microsystems Inc., the Mountain View, Calif., workstation company; Continental Information Systems and United Leasing of England, both in the computer leasing business; Recognition Equipment an Irving, Texas, specialist in data entry equipment; Computer Associates, the mainframe software company in Garden City, N.Y.; and Samsung, the first Korean company to make the worldwide dp big time. A fast-selling PC clone and a steadily growing peripherals market helped buy Seiko Epson a place; and Bell Atlantic became

FIGURE 11 Lucky 13

THE COMPANIES WITH THE HIGHEST RETURN ON SALES

	DTM 100 RANK	COMPANY	1986 % NET RETURN ON SALES	1985 % NET RETURN ON SALES
1	96	Microsoft Corp.	22.1	19.2
2	56	Cray Research Inc.	20.9	19.9
3	75	Norsk Data AS	18.1	19.3
4	89	Lotus Development Corp.	17.1	16.9
5	50	Seagate Technology	12.7	2.9
6	81	Bell Atlantic Corp.	11.8	12.0
7	55	Intergraph Corp.	11.6	12.9
8	93	Computer Assoc. Int'l	11.5	9.9
9	3	Digital Equipment Corp.	10.2	5.7
10	44	Tandem Computers Inc.	9.5	5.0
11	1	IBM	9.3	13.1
12	97	3M	9.1	8.5
13	48	Telex Corp.	8.9	9.8

■ Is Gates a genius? Can DEC do no wrong? Computers aren't the only super thing about Cray. And Bell Atlantic Corp. beats its ex-parent into the winners' circle.

FIGURE 12 Dirty Dozen

12 WHO LOST MONEY

	DTM 100 RANK	1985 RANK	COMPANY	1986 EARNINGS LOSS ($ MIL.)	1985 EARNINGS LOSS/GAIN ($ MIL.)
1	11	8	Control Data Corp.	264.5	567.5
2	86	80	Gould Inc.	101.8	175.7
3	12	13	Wang Laboratories Inc.	86.4	63.3
4	49	46	National Semiconductor	53.6	89.5
5	95	85	Paradyne Corp.	38.5	31.2
6	83	60	Convergent Tech.	32.8	+13.2
7	28	28	Data General Corp.	26.8	+1.7
8	42	34	Oki Electric*	14.8	6.6
9	99	102	Emhart Corp.	10.2	+80.5
10	46	41	Commodore Int'l Ltd.	10.0	237.2
11	58	67	Zenith Electronics Corp.	10.0	7.7
12	61	57	Computervision Corp.	5.8	80.8

■ The 12 losingest companies on this year's DATAMATION 100 racked up losses of $655.2 million, an improvement over last year, when the dirty dozen lost $1.76 billion.

*In local currency, Oki's loss was ¥2.49 billion.

the first of the regional Bell operating companies to join ex-parent AT&T on the list.

Comparing the products sold by the companies of the 1986 DATAMATION 100 to those sold by the 1985 industry leaders reveals that peripherals still make up the largest piece of the business. Fully 27% of total dollar sales are generated by peripherals. This is down very slightly from 1985 when 27.3% of sales were peripherals. Indeed, except for data equipment and microcomputers, all hardware categories—while growing in dollar amounts—took slightly smaller pieces of the total pie in 1986.

Big winners were services, up to 6.7% last year from 1985's 5.7%; and maintenance, up to 13.3% from 11.6%. Maintenance was one of the few market segments in which IBM increased sales in 1986. Another was software, which for the industry as a whole stayed about flat at 7.5% of the total dollar.

The drooping dollar altered the lineup of the top sellers in various market segments. In mainframes, for example, Fujitsu was hoisted into second place by exchange rates. Had the dollar maintained its 1985 strength, second place would have belonged to newborn Unisys, a lineal descendent of last year's mainframe runner-up, Sperry.

Unlike 1985, when every company in the mainframe segment scored some growth, a few mainframe marketeers had diminished sales in 1986: mainframe revenues for Honeywell, Control Data, NCR, Nippon Univac Kaisha, and Nokia all were off when measured in their local currencies.

It should come as no surprise that the big success story in the minicomputer market in 1985 was DEC, with sales up a solid 25%. IBM wasn't looking so good, its fixes in the midrange not coming soon enough or strong enough to prevent a 14% drop in 1986 mini revenues. Other losers in this category were Nixdorf, off almost 25% measured in deutschmarks; Philips, off about 24% in guilders; Nippon Univac Kaisha, off almost 12% in yen; and Ericsson, off more than 9% in krona.

Companies in the microcomputer market looked good, with only a few showing lower sales in local currency than the previous year, specifically Ericsson, Matsushita, and Philips.

Apple reversed its slide, marking a healthy 11% comeback over 1985. Big increases—again, in local currency—were scored by NEC, Toshiba, Fujitsu, Seiko Epson, Zenith, Tandy, Compaq, and NCR. Market leader IBM managed a slight increase—2.3%—after two years of flat micro sales. ■

Methodology

Throughout the year, DATAMATION collects information on more than 200 companies worldwide. The companies are then ranked on the basis of their data processing revenues for the calendar year. All revenue and earnings figures in the current DATAMATION 100 are for calendar year 1986. Because many companies operate on a fiscal year that does not coincide with the calendar year, some data, such as expenditures on research and development, are reported as of the company's most recent fiscal year-end.

For the purposes of the DATAMATION 100 survey, data processing revenues are defined as being derived from sales of the following: computer systems, including mainframes, minicomputers, microcomputers and personal computers, workstations, word processors, office systems, and CAD/CAM systems; peripherals, including terminals, printers, plotters, disk drives, tape drives, magnetic media, and data entry devices; software, including operating systems and applications programs; data communications equipment, including communications processors, local area networks, digital PBXs, multiplexors, modems, and facsimile machines; data services, including custom programming, systems integration, consulting, time-

◄ CIRCLE 18 ON READER CARD

FIGURE 13 The Big Hirers

RANKED BY PERCENT ADDITION IN STAFF

	DTM 100 RANK	COMPANY	1986 EMPLS.	1985 EMPLS.	% INCREASE
1	67	Xidex Corp.	6,500	3,650	78.1
2	50	Seagate Technology	11,872	7,026	69.0
3	96	Microsoft Corp.	1,500	910	64.8
4	93	Computer Assoc. Int'l	2,400	1,600	50.0
5	66	Cap Gemini Sogeti	7,500	5,200	44.2
6	18	Apple Computer Inc.	5,940	4,182	42.0
7	70	AGS Computers Inc.	3,090	2,308	33.9
8	75	Norsk Data AS	3,618	2,799	29.3
9	56	Cray Research Inc.	3,999	3,180	25.8
10	48	Telex Corp.	7,848	6,370	23.2

■ Apple is 10% bigger than it was in the boom year of 1984 and Cray just keeps on growing.

FIGURE 14 Shrinking Populations

RANKED BY PERCENT REDUCTION IN STAFF

	DTM 100 RANK	COMPANY	1986 EMPLS.	1985 EMPLS.	% DECREASE
1	11	Control Data Corp.	34,200	44,300	22.8
2	95	Paradyne Corp.	3,000	3,749	20.0
3	49	Nat'l Semiconductor	30,800	37,100	17.0
4	64	Harris Corp.	26,700	31,400	15.0
5	74	Tektronix Inc.	17,350	20,094	13.7
6	86	Gould Inc.	10,613	12,012	11.6
7	83	Convergent Tech.	2,483	2,759	10.0
8	16	AT&T	311,000	337,600	7.9
9	28	Data General Corp.	15,565	16,535	5.7
10	98	Eastman Kodak	121,450	128,950	5.8

■ AT&T and Convergent are connected by more than coincidence: some of Convergent's shrinkage was due to falling orders from AT&T.

sharing, and remote processing; maintenance and repair; computer leasing; point-of-sale systems; and automatic teller machines.

Explicitly excluded are the following: data transmission or "basic" services from specialized common carriers that are not integrated with a data processing service; standalone electronic or mag card typewriters; standalone electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment; dp supplies, with the exception of magnetic media for disk and tape drives; industrial control devices; central office telephone switches; analog PBXs; and computer-output micrographic systems.

Figures listed in the DATAMATION 100 for mainframes and minis represent only the sale of the processor itself; figures for peripherals and software sold as part of a system are grouped into the peripherals and software categories.

Whenever possible, information in the DATAMATION 100 is obtained from the companies themselves. When a company does not provide information, or does not provide it in a form suitable for this survey, we have estimated the figures based on investigative reporting and analysis of industry trends. The net income reported for each company represents total earnings, not just earnings from dp revenues. Revenues derived from sales to other divisions or units within a company are considered captive sales and are not included in this survey.

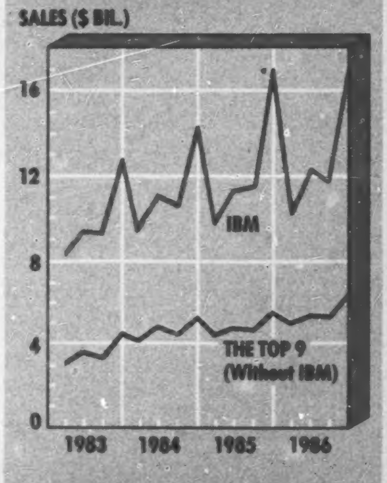
Results for non-U.S. companies are converted into U.S. dollars using OECD average exchange rates. For 1986, equivalents to one dollar in these currencies were the following: Canada, C$1.39; Finland, Fmk5.07; France, FF6.93; Italy, L1,491.1; Japan, ¥168.52; the Netherlands, G2.45; Norway, NOK7.39; Sweden, SKr7.12; the U.K., £.68; West Germany, DM2.17; South Korea, W879.51.

For 1985, equivalents to one dollar in these currencies were the following: Canada, C$1.37; Finland, Fmk6.20; France, FF8.98; Italy, L1,909.4; Japan, ¥238.62; the Netherlands, G3.32; Norway, NOK8.59; Sweden, SKr8.6; the U.K., £.78; West Germany, DM2.94; South Korea, W869.57. ■

More than any other feature published during the year, the DATAMATION 100 is a joint effort by the entire DATAMATION staff. Almost everyone on the staff writes profiles of one or more of the companies. Research is conducted in DATAMATION's bureaus across the U.S., in London, and in Tokyo, with further contributions by DATAMATION stringers thoughout Europe and in Asia. In New York, managing editor Parker Hodges and contributing editor Joseph Kelly beseeched and badgered more than 200 companies, building the most reliable database in existence on the leaders of the dp industry around the world. Finally, everyone on the staff is involved in editing and producing the 50 pages of this issue that are devoted to the DATAMATION 100.

FIGURE 15 Quarterly Report

How 10 leading U.S. companies that sell predominantly computers have performed over the 16 quarters of 1983-86. The combined quarterly results of DEC, NCR, Wang, Apple, Data General, Prime, Commodore, Tandem, and Amdahl are shown in red; IBM's are shown in blue.



■ Is the computer industry out of the doldrums? Tracing the combined quarterly revenue results of nine leading U.S. computer companies suggests the slump may indeed be ending. But at IBM, 1986's fourth-quarter doesn't look much higher than 1985's.

The Datamation 100 - The Leading Worldwide Dp Companies

1986 RANK	1985 RANK	COMPANY	1986 DP REVENUE	1985 DP REVENUE	DP REV % CHG	1986 TOTAL REVENUE	DP AS % OF TOT
1	1	IBM	$49,591.0	$48,554.0	2.1	$51,250.0	96.7
2	—	Unisys Corp.	9,431.0	NA	NA	9,536.7	98.8
3	2	Digital Equipment Corp.	8,414.3	7,029.4	19.7	8,414.3	100.0
4	5	Fujitsu Ltd.	6,575.7	4,309.4	52.6	10,384.5	63.3
5	7	NEC Corp.	6,324.6	3,761.7	68.1	15,034.8	42.0
6	11	Hitachi Ltd.	4,728.8	2,885.3	63.9	28,984.4	16.3
7	9	Hewlett-Packard Co.	4,500.0	4,018.0	12.0	7,102.0	63.3
8	10	Siemens AG	4,387.1	2,928.3	49.8	21,669.6	20.2
9	6	NCR Corp.	4,377.6	3,885.5	12.7	4,881.6	89.6
10	12	Ing. C. Olivetti & Co. S.p.A.	3,865.2	2,518.2	53.5	4,902.3	78.8
11	8	Control Data Corp.	3,346.7	3,679.7	-9.1	3,346.7	100.0
12	13	Wang Laboratories Inc.	2,668.9	2,428.3	9.9	2,668.9	100.0
13	21	Toshiba Corp.	2,605.0	1,608.6	61.9	20,135.5	12.9
14	16	Groupe Bull	2,568.0	1,794.5	43.1	2,568.0	100.0
15	14	Xerox Corp.	2,100.0	1,959.0	7.2	12,919.0	16.2
16	18	AT&T Co.	2,085.0	1,990.0	4.8	34,087.0	6.1
17	23	Nixdorf Computer AG	2,075.1	1,339.9	54.9	2,075.1	100.0
18	17	Apple Computer Inc.	2,031.0	1,753.8	15.8	2,031.0	100.0
19	20	Matsushita Electric Indust. Co.	1,944.0	1,447.6	34.3	29,615.4	6.5
20	15	Honeywell Inc.	1,890.0	1,951.9	-3.2	7,268.2	26.0
21	22	N.V. Philips Gloeilampenfabrieken	1,763.3	1,365.6	29.1	22,464.1	7.8
22	24	STC plc	1,748.7	1,330.8	31.4	2,794.1	62.5
23	19	TRW Inc.	1,625.0	1,450.0	12.1	6,035.9	26.9
24	27	Tandy Corp.	1,560.2	1,200.0	30.0	3,322.8	46.9
25	33	Mitsubishi Electric Corp.	1,345.0	933.3	44.1	12,250.7	10.9
26	26	LM Ericssen	1,344.2	1,228.2	9.4	4,444.4	30.2
27	31	Automatic Data Processing Inc.	1,298.1	1,102.1	17.8	1,298.1	100.0
28	28	Data General Corp.	1,287.6	1,198.9	7.4	1,287.6	100.0
29	30	McDonnell Douglas Corp.	1,189.8	1,104.5	7.7	12,661.0	9.4
30	39	Nippon Telegraph & Telephone	1,160.5	764.1	51.9	31,265.4	3.7
31	32	General Motors Corp.	1,125.9	978.3	15.1	102,813.7	1.1
32	—	Seiko Epson Corp.	1,035.7	541.8	91.2	1,839.5	56.3
33	53	Compagnie Générale d'Electricité	1,025.0	735.2	39.4	11,673.9	8.7
34	50	Nippon Univac Kaisha Ltd.	985.9	633.8	55.6	985.9	100.0
35	37	Computer Sciences Corp.	977.7	800.7	22.1	977.7	100.0
36	35	Amdahl Corp.	966.6	862.0	12.1	966.6	100.0
37	47	Ricoh Company Ltd.	933.8	634.7	47.1	3,506.8	26.6
38	25	Northern Telecom Ltd.	900.0	900.0	0	4,384.0	20.5
38	29	General Electric Co.	900.0	1,130.0	-20.4	36,725.0	2.4
40	54	Comdisco Inc.	886.7	650.5	36.3	901.6	98.3
41	40	ITT Corp.	880.0	756.0	16.4	17,437.0	5.0
42	34	Oki Electric Industry Co. Ltd.	879.6	890.4	-1.2	2,229.1	39.4
43	38	Prime Computer Inc.	860.2	769.7	11.8	860.2	100.0
44	48	Tandem Computers Inc.	835.8	634.6	31.7	835.8	100.0
45	43	C. Itoh & Co. Ltd.	808.7	706.0	14.6	88,119.3	0.9
46	41	Commodore International Ltd.	800.0	750.0	6.7	837.7	95.5
47	42	Texas Instruments Inc.	750.0	750.0	0	4,974.0	15.0
48	49	Telex Corp.	728.2	597.4	21.9	817.0	89.1
49	46	National Semiconductor Corp.	725.0	650.0	11.5	1,678.0	43.2
50	95	Seagate Technology	709.4	303.6	133.7	709.4	100.0

All currency figures are in millions. NA = not available.

NONDOLLAR ACCTG CURRENCY					R&D			
1986 DP	1985 DP	% CHG	COUNTRY	1986 EMPLS	CORP 1986	AS % OF TOT REV	NET INCOME	FISCAL YEAR END
				403,508	$5,221.0	10.2	$4,789.0	Dec.
				98,300	992.0	10.4	254.3	Dec.
				101,000	898.3	10.7	861.5	June
¥1,108,134.0	¥1,026,050.0	8.0	Japan	84,277	910.4	8.8	155.7	March
¥1,065,820.0	¥895,647.0	19.0	Japan	95,796	1,431.6	9.5	200.5	March
¥796,899.0	¥686,985.0	16.0	Japan	164,117	1,754.8	6.1	739.1	March
				82,000	824.0	11,6	516.0	Oct.
DM9,520.0	DM8,610.0	10.5	W.Ger.	363,000	2,488.5	11.5	679.3	Sept.
				62,000	320.7	6.6	336.5	Dec.
L5,769,000.0	L5,036,500.0	14.5	Italy	59,091	262.1	5.4	378.9	Dec.
				34,200	403.2	12.1	-264.5	Dec.
				31,000	190.7	7.2	-86.4	June
¥439,000.0	¥383,000.0	14.6	Japan	124,000	1,246.1	6.2	230.6	March
FF17,796.0	FF16,109.0	10.4	France	26,804	265.8	10.4	39.1	Dec.
				100,367	650.0	5.0	465.0	Dec.
				311,000	2,278.0	6.7	139.0	Dec.
DM4,503.0	DM3,939.6	14.3	W.Ger.	25,576	196.8	9.5	102.3	Dec.
				5,940	150.6	7.4	155.3	June
¥327,600.0	¥344,662.7	-4.9	Japan	135,881	1,484.1	5.0	1,003.4	Nov.
				98,597	473.7	6.5	9.6	Dec.
G4,320.0	G4,534.0	-4.7	Neth.	344,200	1,706.9	7.6	414.3	Dec.
£1,189.1	£1,038.0	14.5	U.K.	NA	NA	NA	151.6	Dec.
				78,644	1,627.5	27.0	217.7	Dec.
				36,000	NA	NA	216.4	June
¥226,654.0	¥222,210.0	2.0	Japan	71,479	528.7	4.3	113.6	March
SKr9,571.0	SKr10,561.0	-9.3	Sweden	75,000	400.0	9.0	53.1	Dec.
				20,000	45.8	3.5	115.5	June
				15,565	143.1	11.1	-26.8	Sept.
				105,000	504.8	4.0	277.5	Dec.
¥195,569.0	¥181,925.0	7.5	Japan	300,000	949.4	3.0	928.2	March
				876,000	4,157.0	4.0	2,944.7	Dec.
¥174,530.0	¥129.000.0	35.2	Japan	12,000	165.6	9.0	NA	March
FF7,103.0	FF6,600.0	7.6	France	150,000	NA	NA	248.2	Dec.
¥166,138.0	¥150,902.0	10.1	Japan	4,121	43.1	4.4	16.6	March
				17,300	NA	NA	30.3	March
				7,150	119.0	12.3	41.8	Dec.
¥157,357.0	¥151,118.0	4.1	Japan	NA	195.8	5.6	67.4	March
				46,202	474.5	10.8	286.6	Dec.
				359,000	3,300.0	9.0	2,492.0	Dec.
				930	NA	NA	79.0	Sept.
				123,000	542.0	3.1	527.9	Dec.
¥148,224.0	¥211,995.0	-30.0	Japan	18,686	145.7	6.5	-14.8	March
				8,621	92.0	10.7	46.9	Dec.
				5,700	91.1	10.9	79.2	Sept.
¥136,288.0	¥168,091.0	-18.9	Japan	10,100	NA	NA	109.7	March
				NA	NA	NA	-10.0	June
				77,270	804.0	16.2	101.9	Dec.
				7,848	43.0	5.3	72.8	March
				30,800	222.4	13.3	-53.6	May
				11,872	18.9	2.7	90.4	June

The Datamation 100 - The Leading Worldwide Dp Companies

1986 RANK	1985 RANK	COMPANY	1986 DP REVENUE	1985 DP REVENUE	DP REV % CHG	1986 TOTAL REVENUE	DP AS % OF TOT
51	45	Storage Technology Corp.	$696.0	$673.4	3.4	$696.0	100.0
52	44	Motorola Inc.	694.0	704.0	-1.4	5,888.0	11.7
53	58	Martin Marietta Corp.	659.4	564.4	16.8	4,752.5	13.8
54	52	Compaq Computer Corp.	625.2	503.9	24.1	625.2	100.0
55	51	Intergraph Corp.	605.7	526.4	15.1	605.7	100.0
56	62	Cray Research Inc.	596.7	380.2	56.9	596.7	100.0
57	—	Lockheed Corp.	551.0	113.3	386.3	10,300.0	5.3
58	67	Zenith Electronics Corp.	548.0	352.0	55.7	1,892.0	28.9
59	68	Arthur Andersen & Co.	546.0	414.7	31.7	2,009.9	27.1
60	65	BASF	520.7	357.1	45.8	18,650.2	2.7
61	57	Computervision Corp.	494.7	441.1	12.2	494.7	100.0
62	66	Mannesmann Kienzle GmbH	488.9	355.7	37.5	627.6	77.9
63	61	Racal Electronics plc	469.1	380.8	23.2	1,902.9	24.6
64	36	Harris Corp.	464.0	480.1	-3.4	2,089.1	22.2
65	90	Atlantic Computers plc	431.0	224.4	92.1	470.6	91.5
66	87	Cap Gemini Sogeti	419.9	245.1	71.3	419.9	100.0
67	69	Xidex Corp.	418.3	232.8	79.7	533.5	78.4
68	—	Samsung	396.0	NA	NA	NA	NA
69	74	Apollo Computer Inc.	391.7	295.6	32.5	391.7	100.0
70	—	AGS Computers Inc.	381.0	279.0	36.6	381.0	100.0
71	72	Shared Medical Systems Corp.	374.9	312.2	20.1	374.9	100.0
72	77	Ferranti plc	351.5	282.1	24.6	926.3	37.9
73	63	Dataproducts Corp.	350.8	370.6	-5.3	350.8	100.0
74	64	Tektronix Inc.	350.0	366.9	-4.6	1,352.5	25.8
75	92	Norsk Data AS	349.1	219.8	58.8	349.1	100.0
76	—	Sun Microsystems Inc.	341.1	147.1	131.9	341.1	100.0
77	55	British Telecom plc	330.4	198.7	66.3	14,008.7	2.3
78	70	Diebold Inc.	325.5	324.2	0.4	413.6	78.7
79	59	Datapoint Corp.	325.0	404.2	-19.6	325.0	100.0
80	78	Contel Corp.	311.0	277.8	12.0	3,073.9	10.1
81	—	Bell Atlantic Corp.	310.0	252.0	23.0	9,920.8	3.1
82	—	CSK Corp.	308.7	189.5	62.9	308.7	100.0
83	60	Convergent Technologies Inc.	305.8	459.3	-33.4	305.8	100.0
84	79	Boeing Co.	300.0	250.0	20.0	16,341.0	1.8
85	86	Plessey Co. plc	294.1	250.0	17.6	2,173.4	13.5
86	80	Gould Inc.	290.0	269.4	7.7	908.8	31.9
87	84	MAI Basic Four Inc.	287.9	249.4	15.4	287.9	100.0
88	91	Sony Corp.	285.2	221.8	28.6	7,863.5	3.6
89	89	Lotus Development Corp.	283.0	225.5	25.5	283.0	100.0
90	—	Continental Information Systems	278.0	NA	NA	283.0	98.2
91	93	Nokia Corp.	273.4	217.6	25.6	2,365.7	11.5
92	—	United leasing	267.6	NA	NA	326.5	81.9
93	—	Computer Associates Int'l Inc.	264.9	170.4	55.5	264.9	100.0
94	—	Nomura Computer Systems Co. Ltd.	263.5	151.7	73.7	263.5	100.0
95	85	Paradyne Corp.	261.1	252.5	3.4	261.1	100.0
96	—	Microsoft Corp.	260.2	162.6	60.0	260.2	100.0
97	75	3M	255.0	295.4	-13.7	8,600.0	2.9
98	97	Eastman Kodak	250.0	210.0	19.1	11,550.0	2.1
99	—	Emhart Corp.	248.5	203.0	22.4	2,094.3	11.8
100	—	Recognition Equipment Inc.	246.6	163.1	51.2	246.6	100.0

All currency figures are in millions. NA = not available.

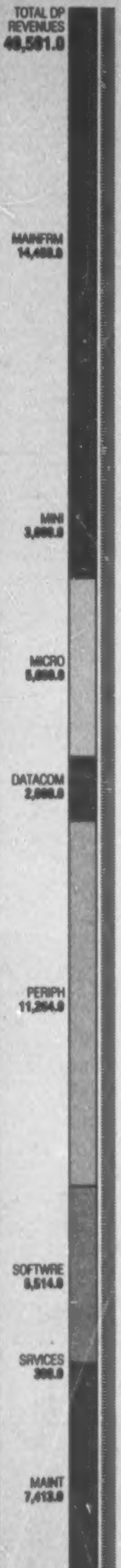
NONDOLLAR ACCTG CURRENCY					R&D			
1986 DP	1985 DP	% CHG	COUNTRY	1986 EMPL	CORP 1986	AS % OF TOT REV	NET INCOME	FISCAL YEAR END
				8,400	$68.5	9.8	$36.2	Dec.
				94,400	492.0	8.4	194.0	Dec.
				65,800	218.9	4.6	202.3	Dec.
				1,900	26.5	4.2	42.8	Dec.
				5,650	57.7	9.5	70.4	Dec.
				3,999	87.7	14.7	124.8	Dec.
				96,900	NA	NA	408.0	Dec.
				33,000	96.0	5.1	-10.0	Dec.
				36,117	NA	NA	NA	Aug.
DM1,130.0	DM1,050.0	7.6	W.Ger.	131,468	NA	NA	NA	Dec.
				4,770	52.7	10.7	-5.8	Dec.
DM1,061.0	DM1,046.0	1.4	W.Ger.	8,864	NA	NA	NA	Dec.
£319.0	£297.0	7.4	U.K.	32,000	142.6	7.5	135.3	March
				26,700	118.0	5.7	68.6	June
£293.1	£175.0	67.4	U.K.	630	2.5	0.5	29.9	Dec.
FF2,910.0	FF2,200.0	32.2	France	7,500	20.9	5.0	27.4	Dec.
				6,500	10.9	2.0	32.5	June
W348,300.0	NA	NA	S.Korea	NA	NA	NA	NA	Dec.
				3,600	44.6	11.4	9.3	Jan.
				3,090	5.0	1.3	8.8	Dec.
				3,700	34.4	9.2	32.0	Dec.
£239.0	£220.0	8.6	U.K.	NA	NA	NA	NA	March
				4,200	65.0	18.5	12.8	March
				17,350	195.3	14.4	55.2	May
NOK2,580.0	NOK1,888.0	36.6	Norway	3,618	31.4	9.0	63.3	Dec.
				3,350	43.8	12.8	24.5	June
£224.7	£155.0	44.9	U.K.	236,000	236.8	1.7	NA	March
				5,320	16.4	4.0	34.9	Dec.
				3,621	30.0	9.2	-1.8	July
				23,098	NA	NA	232.9	Dec.
				80,185	NA	NA	1,167.1	Dec.
¥52,016.0	¥45,128.0	15.2	Japan	4,652	11.4	3.7	19.4	Sept.
				2,483	32.8	10.7	-32.8	Dec.
				115,000	757.0	4.6	665.0	Dec.
£200.0	£195.0	2.5	U.K.	NA	NA	NA	169.6	March
				10,613	104.6	11.5	-101.8	Dec.
				2,924	14.5	5.0	10.4	Sept.
¥48,054.0	¥52,806.6	-9.0	Japan	46,947	720.4	9.2	248.6	Oct.
				1,400	32.5	11.5	48.3	Dec.
				379	NA	NA	13.8	Feb.
Fmk1,386.0	Fmk1,349.0	2.7	Finland	30,000	118.3	5.0	132.9	Dec.
£182.0	NA	NA		NA	NA	NA	NA	March
				2,400	34.7	13.1	30.5	March
¥44,405.0	¥36,112.0	22.9	Japan	1,044	NA	NA	NA	Sept.
				3,000	19.4	7.4	-38.5	Dec.
				1,500	28.2	10.8	57.6	June
				82,000	564.0	6.6	779.4	Dec.
				121,450	1,059.0	9.2	374.0	Dec.
				34,173	43.9	2.1	-10.2	June
				2,907	11.6	4.7	11.3	Oct.

The Datamation 100

The U.S. 100 - The Leading U.S. Dp Companies

1986 RANK	COMPANY	1986 DP REVENUE
1	IBM	$49,591.0
2	Unisys Corp.	9,431.0
3	Digital Equipment Corp.	8,414.3
4	Hewlett-Packard Co.	4,500.0
5	NCR Corp.	4,377.6
6	Control Data Corp.	3,346.7
7	Wang Laboratories Inc.	2,668.9
8	Xerox Corp.	2,100.0
9	AT&T Co.	2,085.0
10	Apple Computer Inc.	2,031.0
11	Honeywell Inc.	1,890.0
12	TRW Inc.	1,625.0
13	Tandy Corp.	1,560.2
14	Automatic Data Processing Inc.	1,298.1
15	Data General Corp.	1,287.6
16	McDonnell Douglas Corp.	1,189.8
17	General Motors Corp.	1,125.9
18	Computer Sciences Corp.	977.7
19	Amdahl Corp.	966.6
20	General Electric Co.	900.0
21	Comdisco Inc.	886.7
22	ITT Corp.	880.0
23	Prime Computer Inc.	860.2
24	Tandem Computers Inc.	835.8
25	Commodore International Ltd.	800.0
26	Texas Instruments Inc.	750.0
27	Telex Corp.	728.2
28	National Semiconductor Corp.	725.0
29	Seagate Technology	709.4
30	Storage Technology Corp.	696.0
31	Motorola Inc.	694.0
32	Martin Marietta Corp.	659.4
33	Compaq Computer Corp.	625.2
34	Intergraph Corp.	605.7
35	Cray Research Inc.	596.7
36	Lockheed Corp.	551.0
37	Zenith Electronics Corp.	548.0
38	Arthur Andersen & Co.	546.0
39	Computervision Corp.	494.7
40	Harris Corp.	464.0
41	Xidex Corp.	418.3
42	Apollo Computer Inc.	391.7
43	AGS Computers Inc.	381.0
44	Shared Medical Systems Corp.	374.9
45	Dataproducts Corp.	350.8
46	Tektronix Inc.	350.0
47	Sun Microsystems Inc.	341.1
48	Diebold Inc.	325.5
49	Datapoint Corp.	325.0
50	Contel Corp.	311.0
51	Bell Atlantic Corp.	$310.0
52	Convergent Technologies Inc.	305.8
53	Boeing Co.	300.0
54	Gould Inc.	290.0
55	MAI Basic Four Inc.	287.9
56	Lotus Development Corp.	283.0
57	Continental Information Systems	278.0
58	Computer Associates Int'l Inc.	264.9
59	Paradyne Corp.	261.1
60	Microsoft Corp.	260.2
61	3M	255.0
62	Eastman Kodak Co.	250.0
63	Emhart Corp.	248.5
64	Recognition Equipment Inc.	246.6
65	Tandon Corp.	242.8
66	Wyse Technology	228.0
67	Concurrent Computer Corp.	227.7
68	Gerber Scientific Inc.	213.1
69	Dun & Bradstreet Corp.	210.0
70	Sterling Software Inc.	209.6
71	Reynolds & Reynolds Co.	204.3
72	Ashton-Tate	203.2
73	Atari	200.0
73	Intel Corp.	200.0
75	Decision Data Computer Corp.	195.1
76	Management Science America Inc.	193.5
77	Micom Systems Inc.	191.6
78	General DataComm Industries Inc.	189.2
79	Miniscribe Corp.	184.9
80	Software AG Systems Inc.	180.0
81	Centronics Data Computer Corp.	175.0
82	Mentor Graphics Corp.	173.5
83	General Instrument Corp.	171.0
84	Cullinet Software Inc.	166.9
85	ISC Systems Corp.	162.4
86	Digital Communications Associates Inc.	162.2
87	Ameritech	159.0
88	NBI Inc.	158.3
89	The Ultimate Corp.	157.6
90	HBO & Company	155.0
91	Cipher Data Products Inc.	152.5
92	National Data Corp.	152.0
93	Policy Management Systems Corp.	151.0
94	Maxtor Corp.	148.0
95	Commerce Clearing House Inc.	147.7
96	Intelogic Trace Co.	145.2
97	Intelligent Systems Inc.	143.5
98	Computer Task Group Inc.	143.4
99	Uccel Corp.	141.6
100	American Management Systems Inc.	135.5

All dollar figures are in millions.



Revenue figures are in millions of dollars. Each increment represents $100 million.

1

INTERNATIONAL BUSINESS MACHINES CORP.
Old Orchard Rd.
Armonk, NY 10504
(914) 765-1900

It was the first time since the Great Depression that IBM has had two consecutive years of falling profits. Geared for 15% to 20% growth per year, IBM's tiny 2.4% increase on sales of $51.25 billion was a severe blow. Analysts speculate that IBM now has an excess capacity—in people, plant, equipment, etc.—of more than 30% than is required by current business levels. Bulging inventories hit a record $10 billion-plus in spring '86. It was not surprising that IBM's earnings plunged 27% to $4.79 billion during the year; profits will continue to be squeezed until IBM scales back its operation.

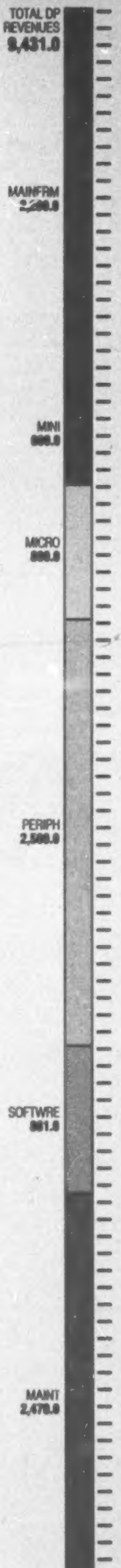
Things would have been worse without the ailing dollar. Revenues from overseas operations increased 20% to $25.89 billion during the year, but would have been down slightly without the huge currency translations. Non-U.S. profits rose just 3.7% to $3.19 billion, providing the first hard evidence that IBM's overcapacity problem has now spread overseas.

The company's top management continued to blame the domestic economy for its woes, and seemed unwilling to admit that its overhead cost structures and investments of the past few years have been higher than necessary. But IBM's corrective actions spoke of dawning understanding: capital spending for the year was slashed 22% to $4.1 billion and inventories reduced 13% to $9 billion, in part through a major write-off late in the year.

Further downsizing came in the form of staff reductions. The company finished the year with 5,000 fewer U.S. employees and will reduce its domestic work force by 12,000 people this year—mostly through early retirement. Similar steps are expected overseas.

Sales of IBM's flagship Sierra mainframes were up (20% worldwide, say insiders), anchoring the company all year, but demand for its peripherals and PCs was down sharply.

At the heart of IBM's problems were its aging and incompatible midrange products. It was here that IBM focused most of its product announcements, kicking off the first quarter with new, aggressively priced 4381s, following up in the second quarter with a flurry of new System/36 and 38 processors and related products (125 in all!), and climaxing in the fourth quarter with the machine many had been waiting for—a departmental 370, the so-called 9370. The company spent much of the year reducing the number of machine architectures in its midrange: deemphasizing its Series/1 and 8100, and cleverly positioning its incompatible Systems/36 and 38 as a single product line.



Revenue figures are in millions of dollars. Each increment represents $100 million.

2

UNISYS CORP.
One Unisys Place
Detroit, MI 48232
(313) 972-7000

As Burroughs chairman W. Michael Blumenthal explained it, "The marketplace for information systems has been a quasi-monopoly; IBM is larger than the next 13 competitors combined, claims 70% of industry profits, and dominates virtually every market segment." The answer, according to Blumenthal, was for Sperry and Burroughs to join forces and gain the credibility and critical mass necessary to fund new product development and compete with IBM. After a month-long courtship, Sperry's board accepted $76.50 per share.

Blumenthal spent most of the rest of 1986 trying to reassure Sperry mainframe customers that he intended to continue to support and enhance the Sperry 1100 computer product line; he also worked at making Unisys' new critical mass a little less massive.

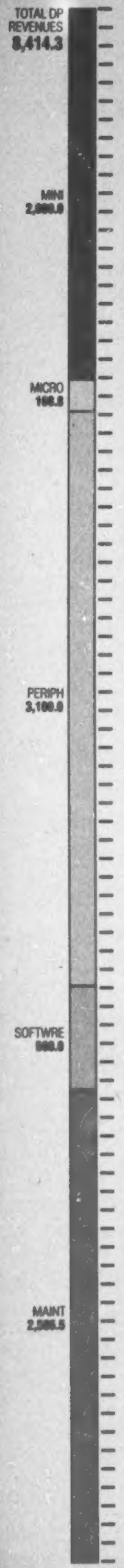
Unisys began with 98,300 employees from the combined companies, about $9.43 billion in dp-related revenue, and a $30 billion worldwide installed base. It also had $4.8 billion in new debt. Unisys quickly brought down that debt and cut operating expenses by selling off its Sperry aerospace division to Honeywell and unloading most of its Memorex peripherals marketing business to a group of its employees.

Unisys also reduced its work force by about 9,600, closing some operations such as its Bristol, Tenn., and Eau Claire, Wis., manufacturing facilities. Unisys predicted it would reduce its work force by some 12,000 by the end of 1987 in an effort to reduce operating expenses by some $275 million a year.

Unisys' efforts to reassure users was surprisingly successful. Although orders for new Sperry equipment dropped off immediately following the merger, Unisys reported they picked up again in the third quarter and improved further in the fourth quarter.

Prior to the merger, Burroughs introduced a midrange entry in its A Series mainframe line, the A 12, and also introduced an entry-level model in its V Series, called the V 310. After the merger, Unisys added a long-planned, medium-scale product line, the CMOS-based 2200/200, compatible with the 1100.

Few observers predict significant mainframe market share inroads against IBM in 1987. Blumenthal, in his year-ending statement, was circumspect: "Because it is difficult to anticipate the duration of the sluggish and uneven computer industry demand, particularly in the United States, and the continued uncertainty as to the levels of defense spending, the company is not planning for any meaningful benefits from industry conditions during the year."



3

DIGITAL EQUIPMENT CORP.

146 Main St.
Maynard, MA 01754
(617) 897-5111

While it was IBM that made most of the announcements in this past "year of the midrange," it was Digital that made most of the midsector money. It was all a matter of timing. IBM was at the tail end of its current product cycle and could put only aging minis into the field; Digital's cycle, however, was just beginning. Digital's momentum, and its positioning as the company with the right products to serve as the prime contractor for networks, allowed it to gain market share from all its rivals.

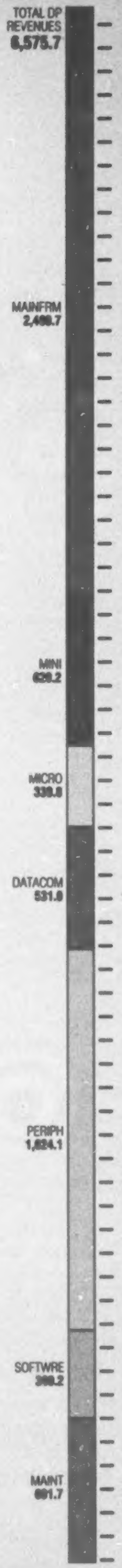
It outgrew the industry by a large margin. Revenues were up almost 20% during the calendar year, to $8.4 billion, but the real eye-opener was the mini maker's net profit: in an ailing industry, its net grew a staggering 115%, to $861.5 million. During the final quarter, the margin hit a record 51.8%, a familiar range for IBM but virgin territory for Digital.

The company bucked every industry trend: hiring was up 11%, bringing its employee total to 101,000; R&D spending rose 16.6%, to $898.3 million; capital expenditures were up; and while others complained of a weakening of overseas demand, that was up too—especially in Europe, which accounted for 33% of all revenue (up from 31% in '85). International revenues accounted for 44% of Digital's 1986 total, up from 40% the year before—although the company is still finding Japan and the Far East a tough nut to crack.

Digital's strategy for the year was to target large decentralized companies in the service sector and in IBM bastions where Digital historically has been weak. Recently, it added health care and food and beverages as targets. Digital claims major successes; for example, it gained 25 new customers in the "true blue" insurance business.

Meanwhile, it extended its nine-year-old VAX design both up and down. The first quarter saw enhancements at the top and bottom of the line (a pattern that has since been repeated, early this year) when Digital announced its biggest computer to date, the 12MIPS 8800 (prices starting at $650,000) and its low-end 8200 and 8300. A second generation midrange machine, the 8500, followed in the second quarter, and then two more upper-end offerings, the commercially oriented 8550 and 8700 for industrial and scientific customers, in the third quarter. All six new VAX models use the VAX Bus Interconnect architecture announced in January 1986. By September 1986, Digital felt confident enough to announce its first personal computer since its failure with Rainbow over two years ago.

Revenue figures are in millions of dollars. Each increment represents $100 million.



4

FUJITSU LTD.

Marunouchi Center Bldg.
6-1 Marunouchi 1-chome
Chiyoda-ku, Tokyo 100, Japan
(81-3) 211-5236

In 1986, Japan's number one computer maker eked out a small revenue increase: overall sales rose almost 12% to ¥1.75 trillion ($10.4 billion), but profits were off an estimated 49%. Dp revenues were up 8% to ¥1.1 trillion ($6.57 billion). Semiconductors, accounting for 12% of total sales, continued to be the darkest spot on Fujitsu's balance sheet, owing to an industry slump and unfavorable exchange rates.

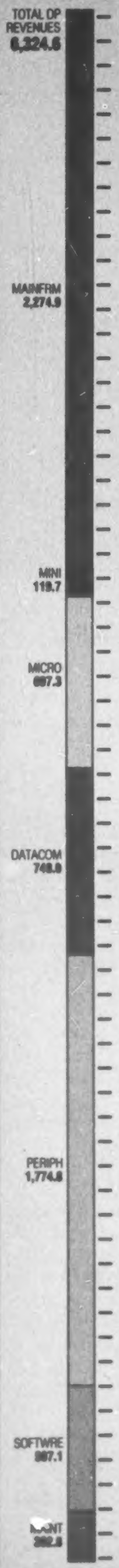
The top-end M-780, introduced in November 1985, boosted both sales and profits, with 79 systems ordered by the end of 1986. But first shipments were delayed by half a year, putting it far behind IBM's 3090 and Hitachi's M-68X. Sales of the older M-380 were flat, with 247 orders received in the first half of the fiscal year (April through September).

New products included the 9450A business workstation, the K-series R model office computers, the low-end VP-30 supercomputer, the FM R series of pcs, and the FETEX-3000 series of large-scale PBXs. The last, consisting of four models with from 1,200 to 16,000 lines capacity, were very successful: 250 shipped in the March-to-July period alone and will be up for export before long. Office computers of all types were up 50% over the previous year, thanks to an increase to 350 dealers from 200, and to 200 application programs from 73.

Operating system vagueness hampered Fujitsu in the mid- and large-sized general purpose category, confusing customers who wondered about the future of the IBM-compatible strategy. In October, the company announced development of a new OS to replace the OSIV/F4 MSP.E20 introduced in 1984. Although Fujitsu claimed the new system was 90% compatible with IBM's MVS/XA and that it had no intention of abandoning its pcm strategy, the company plans to enhance the OS by adding new features. Fujitsu also announced the sale of its first mainframe running Amdahl's UTS Unix in native mode, thereby renewing speculation that the company views the AT&T OS as a way out of its IBM-compatibility dilemma. In May, Siemens stopped offering the Fujitsu OS with the hardware it was marketing under the Siemens name. Later in the year, Siemens formed Comparex, a joint venture with BASF, to sell both Hitachi and Fujitsu hardware—a blow to Fujitsu's image even before sales began.

Construction of a semicustom IC plant in Oregon was started late in the year, an ironic turn after the company's threat in March to close its San Diego memory chip factory after being accused of dumping EPROMs.

Revenue figures are in millions of dollars. Each increment represents $100 million.



5

NEC CORP.

33-1 Shiba 5-chome
Minato-ku, Tokyo 108, Japan
(81-3) 454-1111

NEC was hard hit by the appreciating value of the yen, with overall corporate revenues increasing only an estimated 7.6% to ¥2.5 trillion ($15 billion), and profits off more than 43% in local currency. Data processing sales were up 19% in yen, though, which helped make up for red ink in semiconductors. DATAMATION estimates NEC's dp revenues to be ¥1.1 trillion ($6.3 billion). NEC has responded to the problems of the expensive yen and increasing trade friction with a flurry of overseas activities. Not long after the controversial discounted supercomputer sale to the Houston Area Research Consortium (HARC) that brought accusations of dumping, the company set up a joint venture with Honeywell, called Honeywell-NEC Supercomputer Inc., to sell its SX series in the U.S.

Late in the year came another strategic tie-up, with Honeywell and Bull of France to develop, produce, and market computers. With storms brewing over trade and national security issues in the U.S., NEC took only 15% of the new company, less than expected.

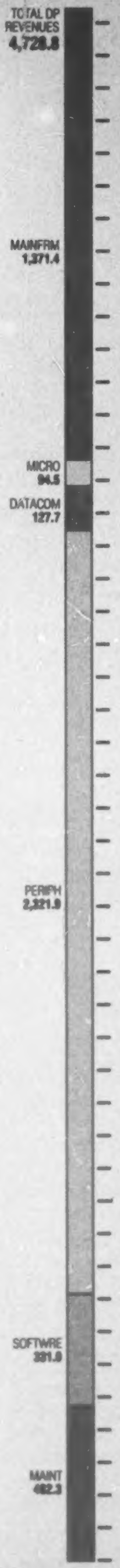
Back home, the company brought out the ACOS 2000 series, with a top four-processor version boasting 170MIPS performance and 512 megabytes of main memory. Covering all bases, in October the company also announced it was introducing a Unix System V-based A-UX operating system as an alternate to ACOS for general purpose mainframes, and that it was expecting a 20% yearly increase in the Japanese Unix market for the next five years. New MS4100 superminis were also introduced.

With overseas production already accounting for 15% of total sales, and having the only integrated semiconductor plant in the U.S. owned by a Japanese firm (in Roseville, Calif.), NEC stepped up overseas manufacturing, beginning production of telecom equipment at its ninth U.S. plant, in Hillsboro, Ore. NEC also said it would expand its Boxborough, Mass., factory to begin making disk drives.

In Asia, digital PBX technology was licensed for manufacture by GoldStar under a seven-year, ¥1 billion ($5.9 million) contract. An opening into the Chinese pc market was initiated in December with an agreement to develop jointly with the Chinese Academy of Sciences a Chinese language keyboard and software for NEC's 16-bit PC-9801 micros.

With about 50% of the Japanese market, NEC is far and away the leader in domestic sales of pcs, but it has done poorly overseas. To overcome that problem last year, it emulated Toshiba by bringing out its own PC-compatible laptop, the MultiSpeed.

Revenue figures are in millions of dollars. Each increment represents $100 million.



6

HITACHI LTD.

6, Kanda Surugadai 4-chome
Chiyoda-ku, Tokyo 101, Japan
(81-3) 258-1111

With an export ratio of 30%, and 10% of total domestic production going to the U.S., Hitachi suffered from the increased value of the yen: sales were down about 3% and profits off an estimated 25%. Yet, dp sales of ¥796.9 billion ($4.73 billion) were up 16%, due largely to strong demand for the top-end M-680H and M-682H mainframes. The Sierra competitors were introduced in September 1985 and first shipped in spring '86. By year-end, 186 orders for the M-68X had been received.

Computer exports were up spectacularly. In the April-to-September period they registered a 41% increase over the previous year, and production of cpus for export, mostly of the M-680H, increased late in the year to 40 units per month from 30. The weak market kept down sales of midrange machines, but workstations came on strong, as Hitachi boasted 30,000 orders for the 2020 and 2050 workstations between September 1985 and the end of 1986.

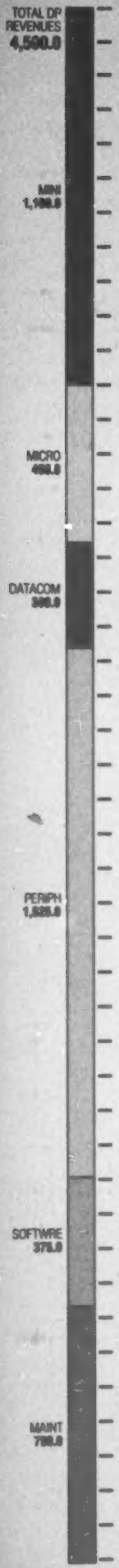
The company aggressively dogged IBM's footsteps, introducing three new M68X models. The high-end, three- and four-processor M-683H and M-684H were announced in May for first shipment this spring, and the M-680D, the entry-level machine in the series, was shipped in December. Two smaller mainframes, the M-660H and M-660K were brought out as replacements for the M-260 series.

Overseas deals also bode well. In February the company announced it had sold 15 large-scale computers to the Bank of China, the first of them delivered in the fall. In May, it sold China a complete on-line banking system consisting of two M-240Ds connected to 160 Chinese language terminals in 40 offices of the Industry and Commerce Bank of China.

Strategic agreements occurred in Asia and Europe. A joint venture, GoldStar-Hitachi Systems Co., was established to provide systems and software support in South Korea, and GoldStar was licensed to manufacture and sell the M-240 and M-260 midrange machines in that country. In November, Siemens of West Germany, previously an exclusive Fujitsu oem, created a joint venture with BASF, called Comparex, to market Hitachi and Fujitsu mainframe hardware running Siemens' BS2000 OS.

The bright dp picture contrasted sharply with the overall outlook: capital equipment spending slashed, executive salaries temporarily cut, and 500 workers transferred from semiconductors to software development. Though increased computer sales nearly offset the drop in semiconductors, VCR exports to the U.S. and color tv sales to China sagged badly.

Revenue figures are in millions of dollars. Each increment represents $100 million.



7

HEWLETT-PACKARD CO.

3000 Hanover St.
Palo Alto, CA 94304
(415) 857-1501

Despite modest gains in revenue and income during 1986, a black cloud remains over Hewlett-Packard. After five years and hundreds of millions of development dollars, HP, in February 1986, finally unveiled Spectrum, its new RISC-based "Precision Architecture," which will serve as the foundation for minicomputer, engineering workstation, and manufacturing systems. But the bubble burst in September when HP announced that shipment of the first Spectrum version of the HP 3000 minicomputer would be delayed by operating system problems until mid-1987.

Since the 3000 line generates almost one third of HP's revenues, the delay of the much needed, much publicized, higher-powered mini was cause for alarm. HP was able to satisfy some of its customers who were running out of power by introducing the current top-of-the-line Series 70 (based on conventional HP 3000 architecture), but its plans to woo new customers were undoubtedly set back.

On the brighter side, in November the company shipped the HP 9000 Model 840, a Unix-based version of Spectrum targeted at engineering and manufacturing applications. With the 840 out the door, HP showed that its basic RISC architecture could be up to snuff.

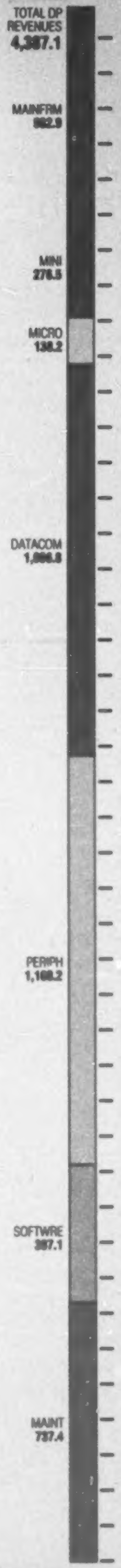
Following 1985's decline in profits, HP made cost-cutting a top priority, second only to work on Spectrum. Among the measures were pay cuts, hiring freezes, and an early retirement plan. By year's end, worldwide employment was cut by 2,000, now holding at 82,000.

Net revenues for fiscal 1986, ended Oct. 31, were up 9% to $7.1 billion, while net earnings rose 5% to $516 million, or $2.02 a share. HP's dp revenues in calendar 1986 were $4.5 billion, an increase of 12% over 1985. DATAMATION estimates that HP's mini sales increased less than 5%, while peripherals and maintenance services revenues were way up.

Orders grew 13% for the year, a welcome change from 1985's measly 1% gain. But U.S. orders edged up only 4%, because of "a difficult business environment," said company execs. International orders rose 23%, a large portion of that a result of the falling dollar.

Partially in an effort to manage Spectrum, HP reorganized several times during the year. The most significant change took place on July 1 when HP split its Information Systems and Network Sector into two groups, Systems Technology, responsible for internal technology development, and Business Systems and Personal Computation Sector, concerned with mini, pc, and networking products.

Revenue figures are in millions of dollars. Each increment represents $100 million.



8

SIEMENS AG

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(49-89) 2340

While Siemens' overall corporate revenues dropped 14% to DM47 billion ($21.7 billion) last year, due mainly to poor export sales and falling nuclear power plant orders, the company's dp division managed a healthy increase when measured in actual accounting currency. In dollars, the increase was even more impressive. Siemens' Communication and Information Systems Group showed a 10% gain in revenues to DM8.7 billion ($4 billion) last year. These revenues, when combined with sales of dp equipment and services through Siemens' other divisions, pushed the company's worldwide dp revenues up by 11% to DM9.5 billion ($4.39 billion).

Siemens controls 25% of West Germany's computer market and 8% of the European market. The company made a concerted effort to expand its European business last summer when it opened its first dp marketing division in the U.K. and announced plans to make the company "the fourth largest computer group within three to four years" in Britain. That is an ambitious plan considering Siemens is starting from scratch in the tough British market.

In its home market of West Germany, Siemens' dp sales to banks were particularly strong, topping DM500 million ($230.4 million) for the first time.

Breaking down Siemens' total dp revenues, the 11 models of its 7.500 mainframe series and its telecom switches were the biggest money-makers. The 7.500 mainframes, ranging from 1MIPS to 27MIPS, produced revenues of DM1.3 billion ($583 million) last year; the digital communications business, including PBX sales, brought in DM2.4 billion ($1.1 billion).

While continuing to take its biggest 7.500 mainframe models from Fujitsu, the company set up a new 50-50 joint venture with BASF in November, called Comparex, to handle its IBM-compatible mainframe business.

The Fujitsu machines sold by Siemens with its own BS2000 operating system are not included in the Comparex deal and continue to account for less than 10% of Siemens' total computer business. The company claims 3,500 installations of the BS2000 operating system on computers ranging up from the PC 2000. This desktop mainframe also hosts Sinix, Siemens' Unix derivative. By the end of 1986, Siemens had installed 13,500 systems with an average of three terminals each, making it one of Europe's leading Unix suppliers.

On the IBM PC-compatible front, Siemens extended its range with the PCD-2 running MS/DOS, which it launched in October.

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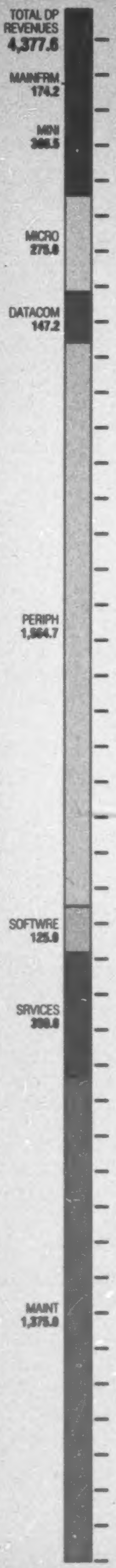

9

NCR CORP.

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Dayton, OH 45479
(513) 445-5000

NCR Corp., referred to by one Wall Street analyst as a "cash machine" because of its low debt and its astute asset management, ended 1986 with its fifth straight quarter of more than double-digit revenue growth. Sales for the year rose 13%, to a record $4.88 billion, with overseas business accounting for almost half of that total. DATAMATION estimates that sales of NCR's dp products grew 13%, to $4.38 billion. Net earnings, squeezed by depressed orders for general purpose computers and cutthroat pricing in NCR's domestic pc business, inched up 7%, to a record $336.5 million.

NCR has weathered the industry storm better than most computer makers because it is less dependent on sales in such depressed industries as oil and heavy manufacturing. Mainframes and communications processors account for less than 9% of total sales. The downside is that these same mainframe customers have become increasingly alienated from the company because of its focus on ATM and financial terminals, pcs, and Unix-based systems. Customers have defected to IBM, Tandem, and others, claiming that NCR is neglecting the high end of its business.

Sensing that something out of the ordinary was required, NCR responded in April with its ambitious seven-model 9800 family of transaction processing systems. This was a radical departure from the batch-style 8000 series that customers currently use, although the two series are object code compatible.

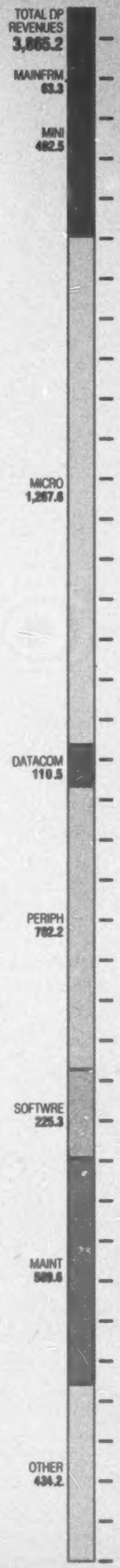
NCR was careful not to forget its new Unix constituency: a new 32-bit entry-level member of its Tower family, the 32/400, was announced and prices were cut across the whole Unix-based family.

In July, the company announced that it was regrouping to mount a concerted attack on the office automation marketplace. Two new divisions—the Computer Systems Division and the Business Systems Division—were formed as part of the restructuring.

Personal computer operations have been bathed in red ink because of aggressive price-cutting by IBM. Though NCR has been achieving its volume objectives, it has not been able to improve its margins. NCR builds its pcs in Augsburg, West Germany, and the declining dollar has put even more pressure on the company's costs.

Though overseas business has been strong—this time aided by a weak dollar—the company revealed that the demand has mostly been for terminals and financial and retail systems, not general purpose computers or pcs.

Revenue figures are in millions of dollars. Each increment represents $100 million.



10

ING. C. OLIVETTI & CO. S.P.A.

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10015 Ivrea, Italy
(39-125) 525

Once again, company acquisitions and alliances were big news at Olivetti in 1986: the company bought Triumph-Adler and Bunker Ramo; and EDS and Toshiba signed on for joint projects. After dramatic growth between 1984 and 1985, Olivetti's revenue growth in 1986 was less spectacular but still healthy. Dp sales grew 15% in local currency to L5.8 trillion ($3.9 billion). Net profit was up 13% to L565.5 billion ($378.9 million).

Personal computers continued to be Olivetti's key product. The company surpassed IBM to lead the Italian market with a 37.5% share and held the number two slot in Europe behind IBM with a 12.2% market share. About 500,000 of its pcs were sold worldwide in 1986, of which 40% went to AT&T. Not surprisingly, the U.S. is Olivetti's largest export market.

Olivetti continued to market AT&T's Unix-based 3B minicomputers along with its own Lineo Uno systems. It also added the fault tolerant CPS2000 to the mini line it markets for Stratus, in which it has a 9% equity investment. Through 1986 and early 1987, Olivetti further reinforced its mini involvement by acquiring 51% of Horsham, Pa.-based Decision Industries' European operation. Olivetti sells and services IBM System/3X-compatible minis.

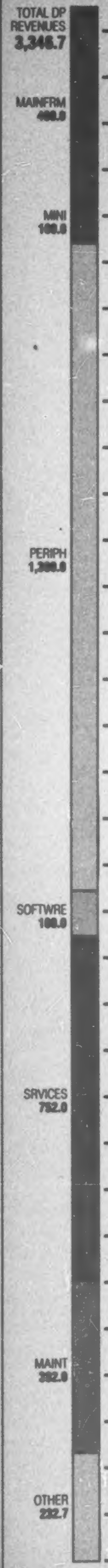
Mainframe sales grew substantially in 1986 to L94.5 billion ($63.3 million) from L80 billion ($40 million) in 1985.

In the flurry of acquisitions and joint ventures last year, several stand out. When Olivetti acquired Volkswagen AG's Triumph-Adler, it automatically increased sales by 18%. In exchange, Volkswagen got 5% of Olivetti's common shares, worth about $260 million (L400 billion). In the U.S., to develop its share of the banking automation market, Olivetti acquired Bunker Ramo Banking Operations, Trumbull, Conn., from ADP.

AT&T continued to be Olivetti's leading partner, both in numbers of computers exported to the U.S. and in opportunities for Olivetti to market AT&T minicomputers and, more recently, PBX products in Europe. Late in 1986, the two companies renewed their alliance, and the agreement limiting AT&T to a 25% share in Olivetti until 1988 was extended to 1990.

The company strengthened its distribution network by investing 89.5% in the startup of MicroAge Europe. Olivetti already had a 46% holding in computer retail chain MicroAge Inc. of Tempe, Ariz. At the other end of the marketing spectrum, Olivetti formed a Large Accounts Division and set up a sales group dedicated to multinational customers.

Revenue figures are in millions of dollars. Each increment represents $100 million.



11

CONTROL DATA CORP.

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(612) 853-8100

The year 1986 was one of massive divestment, restructuring, and management realignment for ailing Control Data Corp., which struggled to end the heavy losses that have plagued it since 1984. In 1986, CDC had a net loss of $264.5 million, compared with a net loss of $567.5 million the previous year. Losses in the computer business in 1986 amounted to $307.1 million, compared with $562.7 in 1985.

CDC shed 13 businesses in 1986, including such units as Healthcare Services Inc., the windmill-based Earth Energy Systems Inc., and Plato/Wicat Systems Co., which supplied educational computer systems to schools. Many of these ventures were born during the reign of William Norris, the company's founder and former chairman, who retired amid the 1985 financial crises. Chairman and chief executive officer Robert M. Price was Norris's handpicked successor.

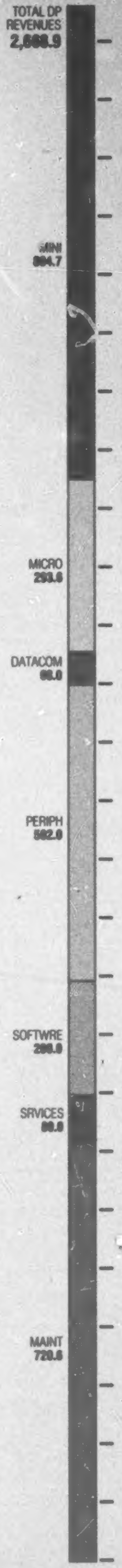
CDC also sold 80% of its stake in Commercial Credit Corp., netting $523.9 million of much-needed cash. A plan to sell Ticketron, CDC's profitable computerized ticketing business, for $140 million to Allen and Co., a New York investment house, fell through when it was denied regulatory approval. CDC also filed a $350 million public debt offering midyear to repay its short-term U.S. bank debt.

Meanwhile, CDC consolidated its worldwide mainframe operation with the formation of the Computer Systems and Services group. In the midst of restructuring, CDC managed to introduce a few new products, including a plant design database management system, two high-performance 16-bit computers for the U.S. government space program, a new 300MB 5¼-inch disk drive, a disk data storage product for supercomputer users, and, this year, a Cyber 180 series departmental computer.

The company continues to fund ETA Systems, its supercomputer subsidiary, although it is rumored that the unit will be merged back into the parent. ETA has hit a number of snags in the development of its first product, the ETA-10, and the product will have a slower than anticipated clock speed in its first release. The subsidiary shipped one unit in 1986 and at press time had orders for three more. ETA has had no revenues in its three years of existence; CDC has poured between $100 million and $150 million into the venture.

Ceo Price says CDC will return to profitability in 1987. Although it has made a valiant effort to pare down its businesses—jettisoning the unprofitable ones—Control Data's future is still uncertain.

Revenue figures are in millions of dollars. Each increment represents $100 million.



12

WANG LABORATORIES INC.

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(617) 459-5000

The year will be remembered at Wang Laboratories as a time of new managers and missed opportunities. The $21.4 million in first-quarter profits seemed to herald recovery, but those results proved a false spring: Wang slipped back into the red in the third and fourth quarters, finishing 1986 with a loss of $86.4 million. The red ink flowed despite a nearly 10% pickup in annual revenues to $2.67 billion from $2.43 billion, a gain credited to European operations and higher service revenues.

Wang relied on plant consolidations and continued work force reductions to stem the losses. Its widely held Class C stock fell to a low of $10.75 from $29 a share late in the year. Profits suffered from hamstrung sales of high-margin VS 300 systems, which were beset by operating system bugs. It wasn't until a third-quarter revision alleviated the problems that volume shipments could begin.

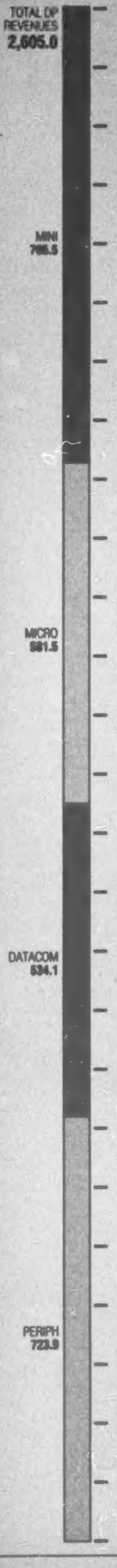
As part of his plan to improve results, Wang chairman An Wang replaced executive vice president for worldwide sales J. Carl Masi, taking personal charge of worldwide sales and marketing. The change wasn't to last the year. As lackluster U.S. sales continued to sap Wang's finances, elder son Frederick A. Wang took over from his father as president. U.S. sales and marketing assumed a decidedly European accent as Wang Europe senior vice president Ian Diery took over U.S. operations.

Despite management changes, Wang pressed ahead with a three-pronged strategy to boost its role and visibility in the dp market: Wang will concentrate on services, voice and data integration, and systems integration. The company kicked off its first formal software service program, and acquired for about $156 million in stock the outstanding shares of PBX maker InteCom Inc., Allen, Texas.

Wang's systems integration focus produced joint marketing agreements with Apollo Computer Inc. and Sun Microsystems Inc. in the CAE and CAD/CAM markets; and with Texet Inc. and Aldus Corp. in the electronic publishing market.

Outside the U.S., Wang's European and Canadian subsidiaries led the corporation into applications sales using software acquired from third-party developers. Such systems integration efforts resulted in a $34 million (Canadian) contract to provide British Columbia with systems and software for road mapping and design, and a five-year, up to $480 million pact to furnish the U.S. Air Force with resource-sharing VS computers, software, and network connections to IBM mainframes.

Revenue figures are in millions of dollars. Each increment represents $100 million.



13

TOSHIBA CORP.

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Last year marked a strategic turning point for Toshiba, with management changes and a new focus on data processing. The high price of the yen kept overall corporate revenues essentially flat, with profits down 41%. Dp was one of the company's bright spots, however, with sales increasing an estimated 15% to ¥439 billion ($2.6 billion), about 13% of total revenues.

Without the runaway success of the T2100 and T3100 PC-compatible laptop computers, dp results wouldn't have looked so good. More than 140,000 were sold, three fourths in the U.S., boosting Toshiba's total pc revenues to ¥98 billion ($581 million). A version with Japanese language MS/DOS was introduced domestically in November and sold 10,000 in its first two months.

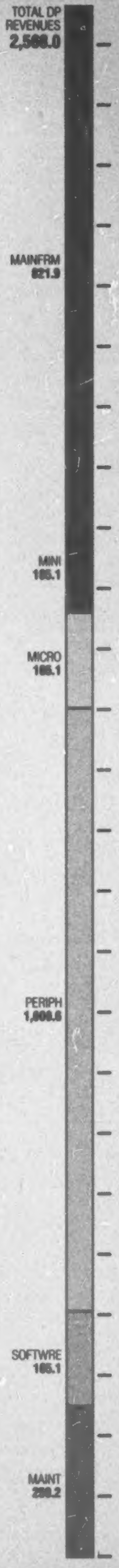
A couple of important holes in the dp product lineup were plugged. The company announced an agreement to market two models of AT&T's System 75 medium-capacity digital PBX, the TX-8200, which can control up to 320 circuits, and the TX-8500, which can handle 800. The agreement builds on that of the previous October for the marketing of AT&T's Datakit virtual circuit switch, and allows Toshiba to offer comprehensive data networks of various sizes, since the company's own PBX products can handle only 120 lines. Another space filled by a foreign product is the engineering workstation slot, for which the Sun Microsystems Sun-3 is being imported. The machine was first used only internally, but last year the company added some Japanese software and began marketing it as the AS 3000 series.

The PBX and the workstation don't contribute much to revenues, but they are key products in Toshiba's positioning strategy. Since it doesn't sell mainframes, the company is trying to offer its machines and networks as comprehensive systems that can support and connect any type and number of mainframes.

Top level personnel changes accompany the company's new dp/systems orientation. Sugiichiro Watari, who succeeded Shoichi Saba as president on April 1, was charged with implementing the new integration strategy. New heads for the industrial electronics and information systems groups were also named.

Exports decreased because of the expensive yen, but overall sales of peripherals, microcomputers, and data communications equipment rose 21%, to ¥310 billion ($1.84 billion). Domestically, the so-called personal word processor, a typewriter-like machine with LCD screen and memory, did well, as did the TOSFIL optical document filing system.

Revenue figures are in millions of dollars. Each increment represents $100 million.



14

GROUPE BULL

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75116 Paris, France
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When Honeywell Inc. said it would restructure its dp interests, Bull had no choice but to seize the opportunity of a more stable relationship with its erstwhile partners, Honeywell Information Systems (HIS) and Japan's NEC. Bull and NEC, tied to HIS by technology exchange agreements, were both prime candidates for taking over their partner in order to retain control of their technology and their destinies.

As dominant partner in the new U.S. affiliate Honeywell Bull Inc., Bull is thought to have gotten a bargain for its $130 million outlay. It now has a 42.5% stake and is expected to amass a 65% holding within two years.

After years of financial woe, Bull is relatively healthy. Its debt-to-equity ratio was down to 1.6:1 by the end of 1986, compared to 8:1 in 1983. The HIS buy absorbed 30% of the funds Bull earmarked for investments in 1987.

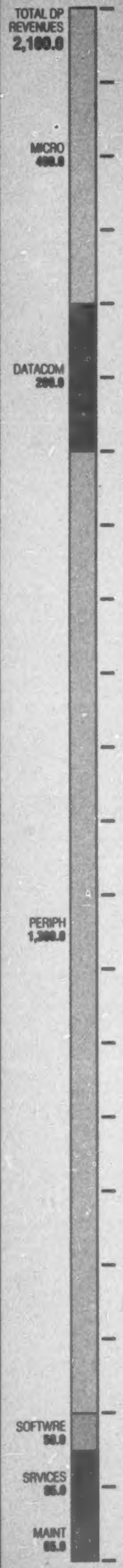
The company met its earnings target in 1986, despite sluggish markets that depressed revenue growth to 10.5% instead of the hoped for 15%. Earnings jumped 146% to FF271 million ($39.1 million), representing a margin of 1.5% on revenues of FF17.8 billion ($2.6 billion). Export revenues increased at a slower pace than domestic sales due to the depreciation of the dollar. West Germany remains Bull's biggest export market, contributing 25.3% of foreign revenues, followed by the Benelux countries (20%), Scandinavia (11.7%), and the Iberian peninsula (10%). Bull opened so-called "competence" centers in Spain for banking systems and in Norway for networking and was given the go-ahead to set up manufacturing facilities in Argentina.

Starting with the introduction of the AT-compatible Micral 60 in January 1986, Bull pushed out a stream of new products. Mainframe, minicomputer, and workstation lines were enlarged and upgraded, with particular attention to systems software and networking.

Bull reaffirmed its commitment to existing oem suppliers such as Convergent Technologies and Ridge Computer, but no new product families were born. Bull also restructured its small systems business by merging the Micral micro group, the Transac workstation division, and its Sems scientific mini supplier into a single subsidiary called Bull MTS.

The brightest star in 1986 was the company's smart-card subsidiary, Bull CP8, which doubled revenues to FF240 million ($34.6 million) and moved into profitability. The Norwegian banks signed a contract for 500,000 cards in November 1986, but the French banks and PTT still account for the bulk of CP8's orders.

Revenue figures are in millions of dollars. Each increment represents $100 million.



15

XEROX CORP.

P.O. Box 1600
Stamford, CT 06904
(203) 329-8700

Document processing is the byword at Xerox Corp. these days: late in 1986, the company created a new Business Products and Systems Group responsible for most of the product planning, development, and manufacturing previously carried out by the Reprographics Business Group and the Xerox Systems Group. Paul A. Allaire, named Xerox president in mid-1986, says the strategic focus of the new group "will be on document processing, which incorporates xerography, advanced electronics, and computer systems to create, reproduce, print, distribute, and file documents in either paper or electronic form. Our document processing strategy requires that we treat reprographics and systems as unified resources rather than as separate technologies."

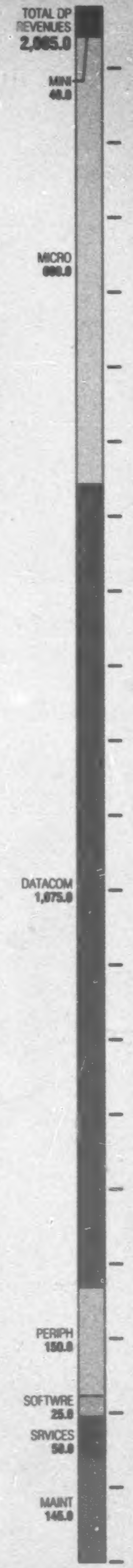
DATAMATION estimates that sales of Xerox's information processing products were up 7% to $2.1 billion. That was not good enough to offset an overall earnings decline in the Business Products and Systems Group. While revenues for the new group grew by 8% to $9.35 billion (representing more than 70% of total corporate revenues), its profits were down to $260 million, a drop from 1985 profits of $351 million by the Reprographics Business and Xerox Systems groups.

Allaire blames the earnings drop on a drop in capital spending both in the U.S. and overseas and said actions have been taken to cut overhead, including a hiring freeze and an early retirement offering. Xerox also stopped selling pcs for general use, and now sells them only as part of desktop publishing systems.

The firm named a new vice chairman, Melvin Howard, whose background is in financial services. Xerox Financial Services Inc. has seesawed for the past three years: in 1984, financial services provided the company's only profit growth; in 1985, it dragged down profits; in 1986, it rebounded to account for fully 47% of total corporate profit on 30% of corporate revenues. This group includes Crum & Foster, Xerox Credit Corp., and Van Kempen Merritt Inc.; it grew 19%, to $3.6 billion. Total corporate earnings in 1986 were $465 million on revenues of $12.9 billion. In 1985, Xerox earned $475 million on revenues of $11.6 billion.

Xerox chairman David T. Kearns is optimistic: "We're going toe-to-toe with the Japanese and with our domestic competitors in the document processing market," he told a group of financial analysts early this year. "We also have a strong base in financial services and we'll continue to grow our business on both sides of the company."

Revenue figures are in millions of dollars. Each increment represents $100 million.



16

AT&T CORP.

550 Madison Ave.
New York, NY 10022
(212) 605-5500

After yet another depressing year in the dp business, AT&T got a spring break in 1987. When senior vice president Vittorio Cassoni, AT&T's Olivetti-bred computer chief, talked to the press about dp strategy and some new products, the stock market heard and was impressed, raising stock prices. In his message to stockholders in the 1986 annual report, James E. Olson, new chairman of the board, acknowledged AT&T's problems: "... it became clear that the company was on the right road but in the wrong lane." Also in 1986, the one-time cradle-to-the-grave employer announced it would cut staff by 32,000.

Still, because the company dominates the businesses of long distance calling and central office switching, there is no shortage of cash flow here. In 1986, AT&T's services revenues, most of it long distance, hit $19.1 billion, up 10% over 1985; of this, 47% was allocated to costs, also an improvement over 1985 when costs took 52% of revenues. Last year, AT&T also regained market share in the central office switching business, edging back toward 60% of the market, as it profited from main competitor Northern Telecom's software problems.

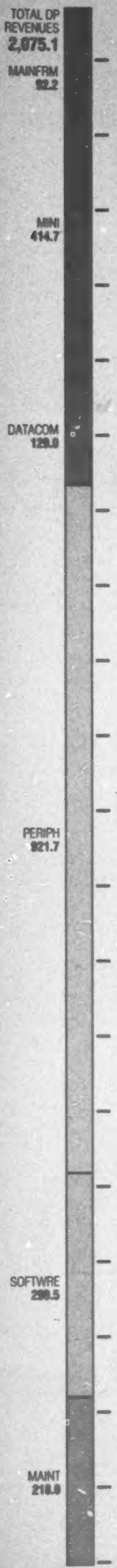
The good business in switching helped mask AT&T's computer problems. The company reports all its hardware sales together, from modems, handsets, and digital switches to minicomputers and pcs. In 1986, revenues in this segment were off $1 billion to $10.2 billion, 9% lower than 1985, while costs were up slightly, to 71% of revenues.

DATAMATION estimates that revenues from dp products were $2.1 billion, a 5% increase over 1985. Increased pc sales were offset by slumping sales of 3B computers.

To turn AT&T's dp operation around, Cassoni announced a five-pronged strategy directed at various-sized work groups, from networked pcs to corporate data systems, with solutions based on de facto and AT&T standards. He delivered some good news about Unix, saying the industry's 1986 shipments of Unix machines were 75% over 1985's and claimed AT&T has 14% of this market. He announced a new 3B2 computer, price cuts on existing 3B computers, and the prediction that AT&T could soon position itself as "the low-cost minicomputer vendor."

The company also announced it would all but abandon its midtown Manhattan headquarters, leaving only 300 staffers in the showplace skyscraper and retreating to Basking Ridge, N.J. However, New York City threatened to file suit and the move was put on hold.

Revenue figures are in millions of dollars. Each increment represents $100 million.



17

NIXDORF COMPUTER AG

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4790 Paderborn, West Germany
(49-5251) 150

Nixdorf Computer survived the sudden death of founder Heinz Nixdorf in March last year. Revenues rose 14% to DM4.5 billion ($2.1 billion), with net income increasing at an even faster rate.

Nixdorf reported strong growth in both domestic and international markets. At home in West Germany, it retained its number three ranking behind IBM and Siemens. In the U.S., Nixdorf made a breakthrough in its attempts to sell integrated systems rather than individual boxes when it scored a $100 million sale to retailer Montgomery Ward, its biggest deal in more than 18 years of American marketing.

Nixdorf was also successful in the European banking market, claiming to be Europe's biggest supplier of computer banking equipment. Its ATMs and cash dispensers accounted for DM1.5 billion ($690 million) of 1986 sales.

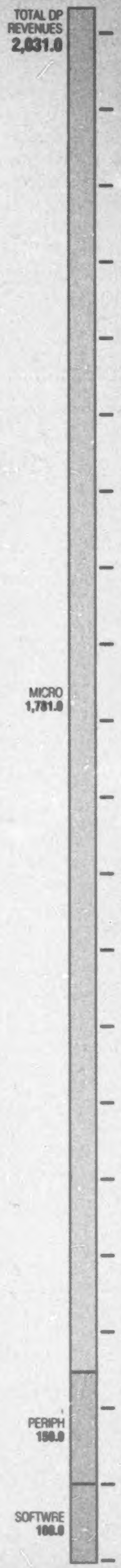
Chairman Klaus Luft expects growth to come increasingly from telecommunications and software products. The company first offered telecommunications switching systems in 1982 and now claims 10% of the West German PBX market, with more than 3,000 switches delivered. Nixdorf's 8818 digital ISDN switching system is available in 11 countries and is being used in ISDN pilot projects in West Germany.

New hardware was added at both the top and bottom ends of Nixdorf's Targon range of Unix systems, expanding performance from 1MIPS to 12MIPS. There were also additions to the company's 8890 small mainframe series running the proprietary NIROS operating system, as well as additions to terminal, data communications, and telecommunications lines.

To support its expanding business, Nixdorf hired 2,300 more workers, bringing the total number of staff to just under 26,000 worldwide. Plans to employ 2,000 more people during 1987 are on the books. Nixdorf boosted its capital spending to DM646 million ($298 million) last year. And not only did the company expand its main plant at Paderborn, it also opened a new factory in West Berlin to make electronic components and magnetic disks.

In October, Nixdorf returned again to the stock market, with a one-for-six stock offer worth DM640 million ($294.9 million). Though the company first went to the open market in 1984, the Nixdorf family continues to control voting stock. The new money will be used to repay short-term debt and for new investments, particularly in software and communications technologies. R&D spending reached DM427 million ($196.8 million) last year, more than 9% of total revenue.

Revenue figures are in millions of dollars. Each increment represents $100 million.



18

APPLE COMPUTER INC.

20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

After its soap opera year of 1985, Apple Computer Inc. staged a stunning turnaround in 1986. Among its accomplishments: the highest profits in its corporate history, the unveiling of higher-powered Macintosh and Apple II microcomputer systems, the acceptance of Apple's desktop publishing solutions inside Fortune 500 companies, and the successful out-of-court settlement of its lawsuit against cofounder Steven Jobs. The only fly in the ointment was flat revenues for the fiscal year, ended Sept. 26. Apple came back slugging, however, in 1987's first fiscal quarter, ended Dec. 26, with a 24% boost in net sales.

For calendar year 1986, Apple earned $155.3 million or $2.39 a share, more than double the $72 million earned a year earlier. Revenues for the year were just over $2 billion, up nearly 16% over 1985. For the first fiscal quarter 1987, Apple's revenues reached $662.3 million (still below the $698.3 million peak it hit two years earlier) with flat earnings of $58.5 million, or 91 cents a share.

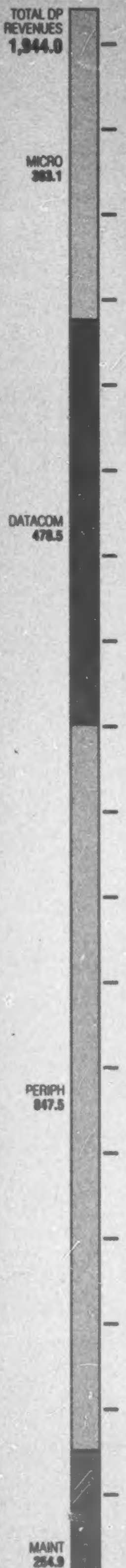
Apple's cost-cutting moves of 1985 were a key reason for last year's much improved earnings. Earnings are expected to flatten for several quarters in fiscal 1987, however, due to Apple's aggressive product plans. With these products, Apple hopes to keep ahead of IBM, which is also improving its graphics options and making a push for Apple's niche markets of desktop publishing and education.

Since January 1986, the company has spun a breathtaking skein of major new product introductions. On Jan. 16, Apple unveiled the LaserWriter Plus printer and the Macintosh Plus, which offered twice the memory of its predecessor. September 1986 marked the introduction of the Apple IIgs. This updated version of Apple's oldest product line sported snazzy graphics and sound capabilities. Apple ran into a slight snag cranking up IIgs manufacturing, but it is said to be back on track.

The new products kept rolling in January 1987, with a new version of the Apple IIe. The real powerhouses were unveiled in March 1987: the Macintosh SE (System Expansion) and the Macintosh II, the so-called Open Mac. These systems offer the open architecture and expansion capability needed by third-party developers, and feature Apple's first Unix and MS/DOS options.

Last year also marked the first time that Macintosh revenues outdistanced those from the Apple II family. "We are no longer dependent on one product for the majority of our profits," states Apple head John Sculley.

Revenue figures are in millions of dollars. Each increment represents $100 million.



19

MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD.

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(81-6) 908-1121

In 1986, Matsushita executives had to take part of their year-end bonuses in company products. Dp sales were off about 5% to ¥327.6 billion ($1.94 billion) while total company sales fell about 1% to ¥4.99 trillion ($29.6 billion). Dp's contribution to overall revenues remained the same at about 7%. Increasing that ratio is the job of new president Akio Tanii. VCRs, the company's star earners, have been hard hit by the rising yen, a mature market, and cheap competition from Korea, with sales down 20% overseas and 13% domestically.

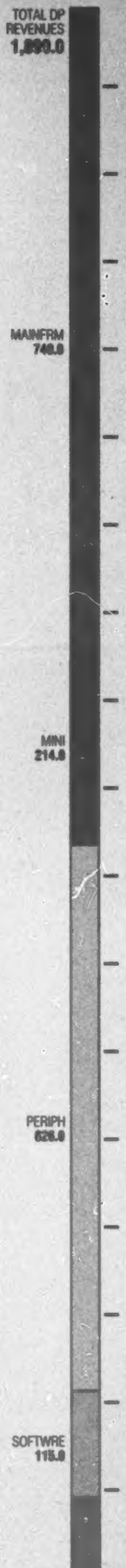
Tanii inherits the third and final year of the "Action 61" program initiated by former president Toshihiko Yamashita to move the company more aggressively into factory- and information-oriented electronics. It's driven by R&D and funded by about 5% of sales, 70% of which goes to business and industrial products.

Emphasis on semiconductors is another key element. In October 1985, a Semiconductor Research Center was opened in Osaka with a staff of over 200, to bring semiconductor R&D into the main company from subsidiary Matsushita Electronic Corp. The next October, the company announced plans to invest in SAE, a Delaware engineering firm, with which it will jointly develop a high-speed microprocessor.

Microprocessors were part of a larger plan to move back into the computer field. In January, it linked up with Kyoto University to develop a parallel architecture supercomputer. Development of a hospital computer system based on optical storage media, both disks and cards, also began. In the industrial area, the company developed an AI-based system that can convert handwritten drawings and numbers into data for input into a CAD machine.

Overseas activities will also be important, both because of exchange rate difficulties and as a way to lessen trade frictions. The company's nearly 50 manufacturing facilities in 26 countries outside Japan account for 14% of total production. With 34% of domestic production being exported, though, there is still plenty of room for more offshore manufacture; by 1990, the company plans to increase overseas production to 25% and export only 25% of domestic production. One such move in 1986 was the start of VCR and color tv production at a new factory in Vancouver, Wash. Construction of the company's first overseas plant for office equipment began in Wales, to be run by newly formed U.K. subsidiary Kyushu Matsushita Electric. The 1987 production target is 20,000 electric typewriters and 50,000 printers.

Revenue figures are in millions of dollars. Each increment represents $100 million.



20

HONEYWELL INC.

Honeywell Plaza
Minneapolis, MN 55408
(612) 870-5200

In 1986, Honeywell made a hasty and costly retreat from the computer business. Competing with IBM in the mainframe arena and coping with the industrywide sales slump became just too much. Instead of fighting a losing battle, Honeywell sold a majority interest in its Honeywell Information Systems (HIS) to longtime business partners Groupe Bull of Paris and Nippon Electric Corp. (NEC) of Tokyo.

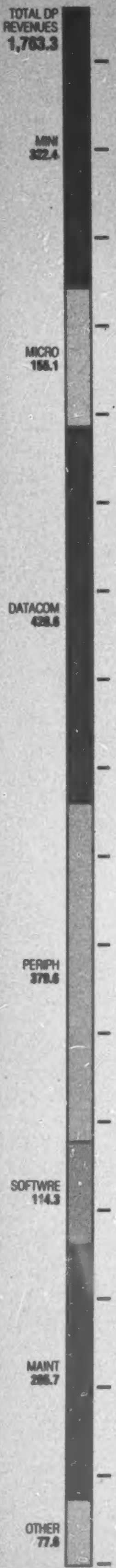
The new venture, called Honeywell Bull Inc., is the first major computer entity owned jointly by U.S., European, and Japanese partners. Honeywell, which still has a 42.5% share of the new business (Groupe Bull also has 42.5%, while NEC owns 15%), plans to reduce its stake to 19.9% by the end of 1988. Jerome J. Meyer, who had been executive vice president of HIS, is the new president and ceo. Jacques Stern, chairman and ceo of Bull, is chairman of the new board of directors.

Financial terms of the deal were announced in December, setting off waves of criticism that Honeywell had sold out too cheaply. For 57.5% of HIS, Honeywell received $527 million in cash. Those figures were tough to match up to HIS's 1985 revenues of $1.63 billion. Excluded from the deal because of foreign ownership concerns was Honeywell's $250 million Federal Systems Division.

Overall revenues at Honeywell, not counting the restructuring, were $7.1 billion, a 7% increase over 1985. Dp revenues were down slightly, to $1.89 billion. Net income was $9.6 million, a far cry from 1985's $281.6 million. In its own financial statements, restated to reflect HIS as a discontinued operation, Honeywell reported a loss of $398.1 million, or $8.83 per share, on revenues of $5.4 billion. The disposal of HIS alone accounted for a loss of $407.7 million. By focusing on its remaining businesses—aerospace, defense, home and industrial automation and controls—Honeywell chairman and ceo Edson Spencer promises that earnings in 1987 will exceed $5 per share.

Despite the Wall Street maneuvering, Honeywell found time to work on computers. In June, it introduced new models of the DPS 6 Plus family of 32-bit minicomputers that are expected to help the new Honeywell Bull break into niche markets. But Honeywell also became embroiled in an industry dispute it would have preferred to avoid. After winning a multimillion-dollar contract to sell the NEC-designed DPS 90 computer to the Air Force, rival Control Data Corp. vociferously accused the two companies of dumping. Both Honeywell and NEC strongly deny those allegations.

Revenue figures are in millions of dollars. Each increment represents $100 million.



21

N.V. PHILIPS GLOEILAMPENFABRIEKEN

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The Netherlands
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Like many of its European colleagues, Philips suffered from the weak dollar and reported a decline in local currency revenues. The company as a whole reported an 8% drop in sales revenues to G55 billion ($22.5 billion), but still achieved a 10% gain in net income of G1 billion ($414 million). Revenues at Philips' Telecommunications & Data Systems Division actually dropped about 5% from the year before, to G4.3 billion ($1.8 billion).

Philips president Cor van der Klugt, who took over from the retiring Wisse Dekker early in the year, admits that the company is still striving to improve productivity and will cut jobs to achieve its aim. It also plans to move assembly lines around the world to gain local advantage when fluctuating exchange rates raise costs and lower revenue.

The Telecommunications & Data Systems division, formed when the company's dp and business communications interests were merged in 1985, is proving to be slow to reach its full potential. Division head Gert Bindels says, "The integration of the two divisions should have been completed by the end of 1986, but the two different cultures have still not melded completely."

Sophomation, Philips' strategic product line comprising wide and local area networks, a digital PBX, processors, software, and terminals, generated 30% of the company's dp revenues. Bindels expects that percentage to double by the end of 1988. Products like Philan, the fiber-optic local area network that was under test last year, are expected to make a significant contribution.

Philips acquired Bunker Ramo's sales organization in West Germany and Switzerland, giving it a handle on the local banking markets. In Japan, Kyocera Corp.'s share in the joint venture selling Sopho-Net was taken over by Philips.

Other joint ventures continued. In the U.S., Philips opened Laser Magnetic Systems with Control Data in Colorado Springs. Philips contributed CD-ROM activities and Control Data expertise in magnetic tape reading and writing devices to the new company. In Europe, Philips pushed ahead with Siemens on its joint megabit memory chip project.

New in 1986 were XT- and AT-compatible pc models. But the most important recent product additions made by Philips arrived early in 1987 when the company launched its P9000 workstations, confirming an early but previously unfulfilled commitment to Unix.

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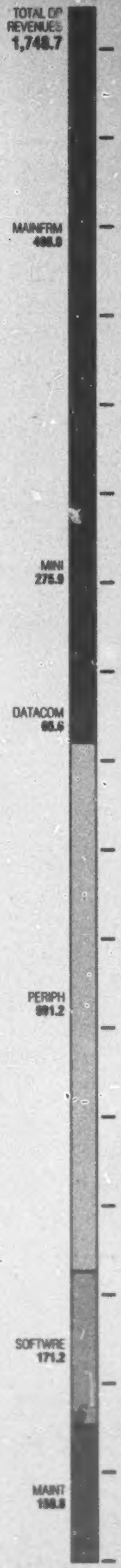

22

STC PLC

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STC staged a remarkable recovery through 1986, going from 1985's after-tax loss of £53.8 million ($69 million) to a 1986 profit of £103.1 million ($151.6 million). The gain was made despite a marginal decrease in total revenues to £1.9 billion ($2.8 billion, inflated by a weak dollar) from 1985's £2 billion ($2.6 billion).

ICL, STC's brightest star and the U.K.'s largest computer maker, saw its revenues grow by nearly 15% to £1.2 billion ($1.7 billion), assisted by favorable exchange rate movements. Sales of the Series 39 mainframes also helped, making their first full year's contribution to revenues. Cost reductions and increased sales resulted in a 46% gain in ICL operating profits of £90.2 million ($132.6 million).

The measures taken by STC to return the group to profit in 1986 followed the austerity plan set out in 1985. Among the businesses to be sold was most of International Aeradio, which STC bought from British Airways in 1983. STC retained only the data communications business. In May, STC sold its Foots Cray semiconductor facility to LSI Logic Europe, bringing the total cash raised from divestments to about £100 million ($147.1 million).

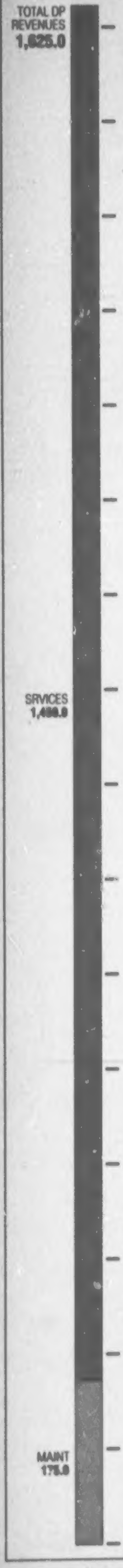
Much of the year's activity at ICL was in developing joint ventures and partnerships to take the company into new markets. Early in 1986, ICL agreed to adopt Computer Consoles' OfficePower software as the key to its departmental systems. It also signed for Cincom's Mantis fourth generation language.

The value-added network (VAN) services business was boosted by a tie-up with GEISCO and by a new shipping service on ICL's Tradanet VAN. Concentrating on core businesses, ICL spun off most of its distributed array processor business to a new company, Active Memory Technology. ICL retained only defense-related work, consolidating it into a new division.

Product additions during the year included new Series 39 mainframe models, as well as enhancements for the One Per Desk integrated terminal and the DRS300 office systems. Making a move away from proprietary operating systems, ICL put Digital Research's Concurrent DOS with GEM on the DRS 300. In the U.S., ICL broke into the Unix market with the Clan multiuser computer in October.

Having cleaned up the balance sheet, STC is on solid ground for the coming year. But it is still the subject of some speculation—last year's rumors of a possible takeover bid from British Telecom or Siemens have not died out as quickly as STC might have hoped.

Revenue figures are in millions of dollars. Each increment represents $100 million.



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TRW INC.

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Cleveland, OH 44124
(216) 291-7000

This diversified conglomerate sells consumer information services, maintains other vendors' hardware, and designs and builds military and space-related information systems. TRW says information systems has become the most profitable and fastest growing part of the company.

Total revenues in 1986 for information systems and services were $1.63 billion, up from 1985's $1.45 billion. Total corporate revenues for 1986 were $6.04 billion, up from $5.92 billion in 1985. Earnings from continuing operations were $218 million.

Computer services, concentrated mainly in the areas of credit and real estate information reporting, brought in $250 million, up from $175 million a year earlier. In 1986, TRW acquired Teknekron Financial Systems Inc., which provides image processing systems and services to banks. The company is expected to have sales of about $50 million in 1987. Revenues from hardware maintenance services, totalling $175 million, were essentially flat compared with 1985. TRW also launched Credentials, a consumer credit information service. It enables individuals to monitor requests for their credit histories and to ease their future credit requests by filling out a master credit application. The company claims that more than 150,000 California families have signed on in the first year.

Most of the firm's data processing business is military related, however. The company has benefited from Strategic Defense Initiative contracts, under which it has developed, among other things, artificial intelligence-based command and control systems. TRW Federal Systems Group won a $98 million contract in January 1987 to reprogram AWIS, the U.S. Army's worldwide communications system, with the language Ada.

The company last year set up a Technology Systems Organization to commercialize management techniques and technologies first developed for the military. One of the first of those products to be sold commercially is a computer modeling system designed to help determine manpower requirements and schedules for software development projects. Another military system with seemingly strong commercial potential is a text searching system that relies on "massively parallel" processing. The Fast Data Finder, based on an internally developed processor chip, is said to scan text at a rate of up to 7 million characters a second.

The company also develops and installs specialized local networks and has expertise in designing secure communications systems.

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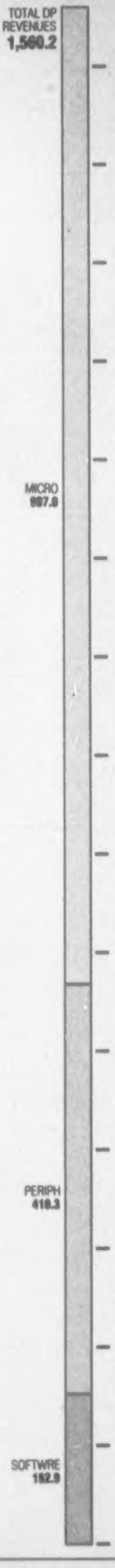

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TANDY CORP.

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(817) 390-3700

The pc was heralded as the first computer for the masses. But in the market-wise, niche-oriented world of the '80s, it didn't quite work out that way. With IBM staking out the corporate world and Apple cultivating the yuppie set, commoners have been getting short shrift. Enter Tandy, which, in 1986 at least, was clearly the superior choice of the masses.

Two years ago, Tandy was on the ropes. A lackluster product line, a home market gone flat, a dubious attempt to jump on the IBM-compatible bandwagon—nothing went right.

But Tandy confounded its critics and executed a sparkling turnaround. In 1986, dp revenues grew 30% to just over $1.5 billion; computers now account for nearly half of total sales. Analysts rank Tandy number three in pcs, behind IBM and Apple. Wall Street took notice of Tandy's changed fortunes and ran the price of its stock up to the high 40s, the highest it's been since 1983. To top it off, the 1986 Tax Reform Act lowered the company's tax rate, prompting Tandy to pay its first dividend to stockholders since it went public in 1960.

The name of the game at Tandy is marketing. Its Radio Shack chain of consumer electronics stores now numbers over 7,000, including 400 with computer centers. All the stores are directly owned or franchised, giving Tandy a low-cost distribution network that is the envy of any pc supplier.

Tandy's other high card is low-cost manufacturing. For its computer line, Tandy does just about everything, from molding the cabinets to manufacturing the circuit boards and power supplies. Tandy's assembly line in Fort Worth was running seven days a week last fall to keep up with shipments of from 60,000 to 70,000 computers a month.

In 1986, Tandy introduced new versions of the PC-compatible Tandy 1000, one for the home and another for small businesses; the Tandy 3000 HL, an XT-compatible computer; and a new version of the AT-compatible Tandy 3000 HD with a 40MB hard disk.

Tandy is countering inroads by Asian-made clones by positioning itself as the quality supplier at the low end, emphasizing its reputation for quality and nationwide service and support. Efforts to appeal to the corporate market have yet to pay off, but Tandy is still trying. A new sales force, 1,900 strong, was established to go after corporate accounts.

Tandy chairman John Roach says he is unfazed by IBM's new PC line. At $1,695, the lowest priced model poses little challenge to the Tandy 1000, which goes for $1,000 or less.

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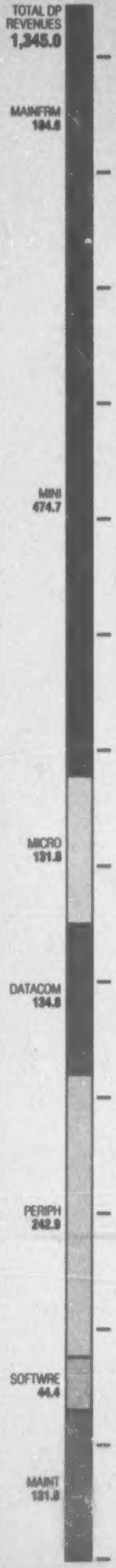

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MITSUBISHI ELECTRIC CORP.

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Mitsubishi Electric, or MELCO, didn't do well overall in 1986. Calendar year revenues were off 1.3% and were headed downward to an estimated 3% drop for the fiscal year that ended this March. Profits were off 52%. Dp products contributed to the only division showing increased sales: Information and Communications Systems and Electronic Devices, up 3%. DATAMATION estimates Mitsubishi's 1986 dp revenues to be ¥226.6 billion ($1.34 billion), up 2% over 1985. Meanwhile, Mitsubishi's heavy electrical, consumer products, and industrial and automotive divisions sagged.

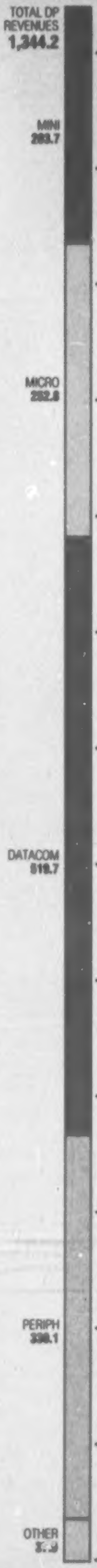
Semiconductors weren't as weak a spot for MELCO as for some of its competitors. Thanks to the extremely modern equipment at its Saijo IC plant, the U.S. Department of Commerce assigned MELCO's memory chips a relatively low fair market value (the price at which the U.S. says they can be sold outside Japan) under 1986's semiconductor trade agreement.

The company's only overseas sales are done through oem arrangements. Its arrangement to supply pcs to Sperry remains in effect despite the Burroughs merger. The other main dp export category is floppy disk drives. Neither area is offering much growth, however: pc production stayed even this year at 140,000 units, while floppy disk drives were up by only 100,000 to 1.3 million.

The only computer category that showed any real growth was that uniquely Japanese product, the office computer, a minicomputer-sized machine with proprietary OS suitable only for a narrowly defined range of business tasks. Sales of fax machines, the other quintessential Japanese OA product, grew by one half to 30,000, although the move to lower-end products did squeeze profits.

Although Mitsubishi has made a small name for itself in the minicomputer market as a supplier of excellent, low-cost hardware for scientific and university users who plan to write their own software, sales in this category were almost flat in 1986. The same holds true for the Prolog-based PSI workstation designed by ICOT, the government-sponsored fifth generation project. MELCO supplied machines for the project's internal use, but commercial sales didn't materialize, despite intriguing rumors that New York financial firms were looking into using the machines in the securities business. Persevering, the company announced it would begin marketing the next ICOT machine, the more compact PSI-II, this spring. In November, the company also said it would be coming out with an 80386-based pc this year.

Revenue figures are in millions of dollars. Each increment represents $100 million.



26

TELEFONAKTIEBOLAGET LM ERICSSON

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Stockholm, Sweden
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Ericsson's sales of SKr31.6 billion ($4.4 billion) were down more than 2% from 1985. With 80% of production headed for export markets, the continuing fall of the dollar leaves the company especially vulnerable. But, leaner than in the past, the company pushed its net income up by 14% to SKr378 million ($53.1 million).

With the exception of Ericsson Information Systems (EIS), the company's operating divisions remained profitable. After two years of sizable losses, the computer subsidiary managed to reduce its deficit to SKr284 million ($39.9 million) last year from SKr806 million ($113.2 million) in 1985.

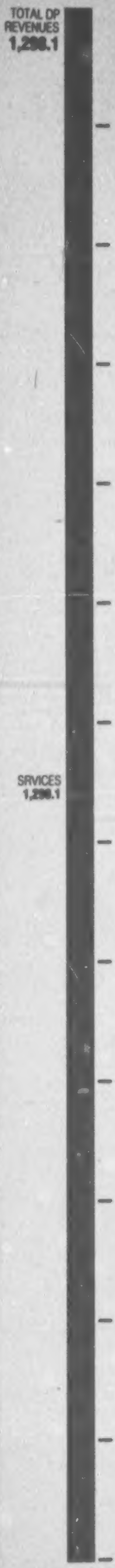
EIS president Stig Larsson admits to missing the target he set himself when taking up the reins at EIS in January 1985. Then, he predicted EIS would break even by 1987. Now, company executives believe EIS will be profitable again early in 1988. Among last year's efforts to enhance the company's standing was a reduction in staff numbers by about 3,000. EIS's key product is the digital MD-110 PBX, which can handle both voice and data communication. It can be configured with over 100,000 lines and last year found export success in China, Finland, the U.S., and other countries.

Ericsson was less lucky in the public switching equipment market, where, despite a gentle climb in sales to SKr11.5 billion ($1.6 billion), income dipped to SKr1.2 billion ($163.2 million) from SKr1.3 billion ($180.1 million). The company attributes the drop in income to the cost of developing its AXE digital switch for the U.S. and U.K. markets; it blames slow sales on increasing competitive pressure in the public switching arena.

On the computer side, Ericsson is still feeling the aftereffects of its 1985 fiasco in the U.S. market. But it is recovering well in the European market. Its pc products have a 14% market share in Sweden, giving EIS second place behind IBM. And in the portable pc sector the company has a stronger hold, taking a 22% market share. Its portable products are built in Japan by Matsushita.

To strengthen its product line in the banking sector, Ericsson signed a joint product R&D agreement with Digital Equipment Corp. in September. Ericsson is contributing expertise in communications, workstations, and banking applications software to the venture, while DEC is expected to put its office automation, networking, and computing knowledge into the common pool. Products will be sold by each company under its own label.

Revenue figures are in millions of dollars. Each increment represents $100 million.



27

AUTOMATIC DATA PROCESSING INC.

One ADP Blvd.
Roseland, NJ 07068
(201) 994-5000

More companies in the industry should have ADP's worries: 1986 marked its 37th consecutive year of increased revenues and earnings. If there is another company in corporate America with such a track record, please stand up. Revenues climbed to $1.3 billion from $1.1 billion in 1985, while net income rose to $115.5 million, from $95.3 million.

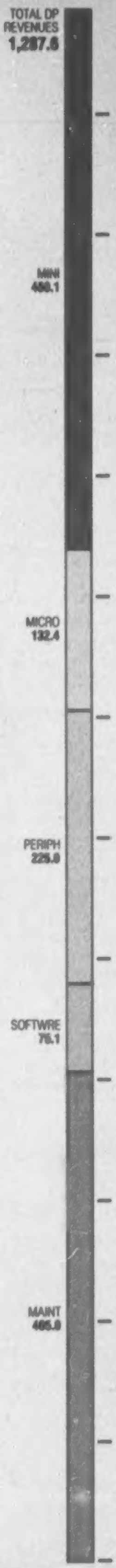
Significant activity in 1986 concerned management changes and new product introductions. In April, Josh S. Weston, chief executive, became chairman when Henry Taub, a founder of ADP in 1949, retired with the honorary title of chairman emeritus. William Turner, a former executive with Texas Instruments who joined ADP several years ago, was named president, succeeding Weston. Together, Weston and Turner formed an Office of the Chairman.

Acquisitions, a mainstay of ADP's business strategy historically, tapered off in 1986 following February's $40 million purchase of Allied Signal's Bunker Ramo Information Systems brokerage service business. In May, the company sold Bunker Ramo's U.S. banking operations to Ing. C. Olivetti & Co. S.p.A. of Italy for $17 million.

Division by division, the year was pretty much steady as she goes. Employer Services, the payroll and tax filing unit and ADP's oldest and largest business, continued to represent about 45% of the company's business overall. ADP introduced a microcomputer-based, on-site payroll product. A National Accounts program, started in 1985 to target companies with over 500 employees, emerged as the fastest-growing part of Employer Services last year, according to Arthur F. Weinbach, senior vice president of administration and finance. Brokerage Services, ADP's second largest business, displaced Quotron by winning a contract with Merrill Lynch for IBM AT-based front-office services. And Dealer Services, about 10% of the company, scored with an exclusive agreement to provide automotive-related services to Hyundai of South Korea. The Collision Estimating Services division introduced Atlas, a system designed for insurance adjusters. The ATM Services unit entered a joint venture with Bank of America to handle 400 ATMs operated in Southland Corp. outlets.

Other major financial activities were the sale in February of $150 million in convertible subordinated debentures, a two-for-one split of common stock, and an increase in the authorized number of common shares to 200 million from 80 million.

Revenue figures are in millions of dollars. Each increment represents $100 million.



28

DATA GENERAL CORP.

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Westboro, MA 01580
(617) 366-8911

Data General's engineering prowess has enabled it to sprint beyond competitors in price/performance. Yet, financially, Data General last year was running in place. Poor U.S. demand for its computers, especially in industrial sectors, produced flat revenues overall and a $26.8 million loss for the calendar year. Sales for the 12 months were $1.28 billion, a 7.4% increase over 1985.

DG president Edson de Castro attributes the worsened financial picture to a temporary change in the way customers view technical criteria: users, he says, have grown less concerned with price/performance and instead seek safe harbors among larger and financially stronger vendors. "In the 'up' cycles, people forget about the fact that business gets lousy," says de Castro. "They're looking for the best buy they can get. . . . Those are the cycles [in which] we can grow market share."

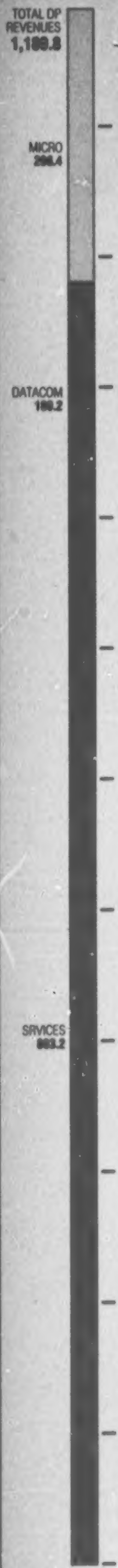
With no clear picture of when the upswing will occur, Data General last year implemented a second round of employee cutbacks, quit volume semiconductor manufacturing, and closed peripherals plants in Austin, Texas, and Hong Kong. Engineering staff shortages were blamed for the demise of a high-end engineering workstation, the DS/7700. The workstation, designed to support a multiprocessor architecture, was canceled after introduction—a result of irremediable technical problems.

The company favored additions to sales personnel and communications engineering as near- and long-term fixes for flat sales. The Communications Systems Group will develop high-speed networks based on optical technologies and produce a private branch exchange integrated with DG's Eclipse/MV computers. The group will also oversee investments in wide area network supplier Dama Telecommunications Inc., semiconductor startup Actel Inc., and digital PBX developer Genioss Inc.

The company completed release of a third generation of Eclipse/MV computers. The 32-bit line gained new strength with the MV/7800, based on a chip set implementation of the MV architecture, and the three-member MV/15000 series, derived from MV/20000 processor technology. It brought users of its 16-bit systems further into the Eclipse/MV family with release of a 32-bit version of its Real-time Disk Operating System (RDOS).

While others now may pass him by, de Castro is content to run in place as long as it's understood there's a future contest to be won. "If we're sitting with the best price/performance . . . we'll go up," he says.

Revenue figures are in millions of dollars. Each increment represents $100 million.



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MCDONNELL DOUGLAS CORP.

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St. Louis, MO 63166
(314) 232-0232

McDonnell Douglas's Information Systems Group (ISG), which specializes in services and systems for numerous vertical industries, had revenues of $1.19 billion for 1986. But for the third year in a row, the group operated at a loss. This time it was $69.7 million, which at least showed some improvement over last year's figures, a $109.3 million loss on revenues of $1.1 billion. The corporation as a whole earned $277.5 million on revenues of $12.66 billion, and said it was affected by the overall "slowdown" in data processing markets.

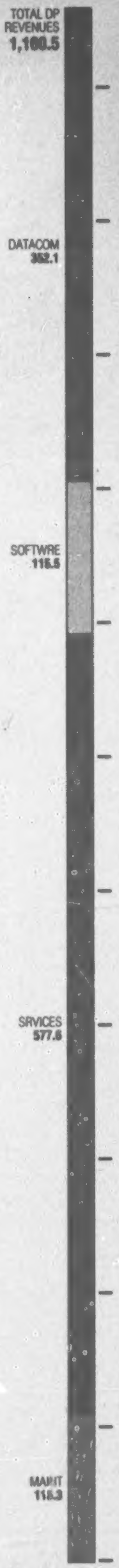
Nevertheless, because of cost-cutting, McDonnell Douglas's information processing businesses managed to show a profit in the fourth quarter of the year, the first pretax earnings for ISG since the group was organized. In fact, the ISG would have showed a profit of $18.2 million in 1986 were it not for the rapid amortization of certain previous acquisitions. Those include Microdata, a veteran maker of small business systems based in Southern California, and Tymshare, a pioneer in the remote computing services sector.

Four years ago, McDonnell Douglas joined those and other businesses with its own remote computing services, primarily geared to engineering and health care markets, and formed ISG. But it has thus far been unable to make the computer business a positive contributor to the bottom line, with the vast majority of the corporation's revenues stemming from military and commercial aircraft production. (A small percentage of ISG's sales are to other McDonnell Douglas units, but the company says these sales are on a commercial basis, in competition with other vendors.)

No major organizational changes took place at ISG during 1986, but Jeremy J. Causley was named an ISG executive officer. Causley, formerly president of the computer operations' international marketing arm, joined McDonnell Douglas as a top executive at Microdata. He replaces the departing Robert A. Fischer.

Under Causley, ISG continued its efforts to cut costs and to sharpen its marketing focus on its specialty markets, which include health care, manufacturing, communications, and banking. Thus ISG sells systems and services for physician and hospital billing, for manufacturers needing computer aided design and manufacturing, and for credit and bank card authorization. It also provides systems integration services, a public-data network, and field maintenance services for its own and other manufacturers' computer equipment. The group is active in 14 foreign countries.

Revenue figures are in millions of dollars. Each increment represents $100 million.



30

NIPPON TELEGRAPH AND TELEPHONE CORP.

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Chiyoda-ku, Tokyo 100, Japan
(81-3) 509-5035

The biggest thing that happened to Nippon Telegraph and Telephone Corp. (NTT) in 1986 has also been called the biggest thing to happen to the Tokyo stock market in this century. When bids were taken in the fall to decide the selling price for the first 12.5% (1.95 million shares) of the stock to be publicly offered, the average price of a single share was ¥1.2 million ($7,120). That would make the total market value of the former PTT ¥18.673 trillion ($110.8 billion) with 300,000 employees and total assets over ¥10 trillion ($59.3 billion).

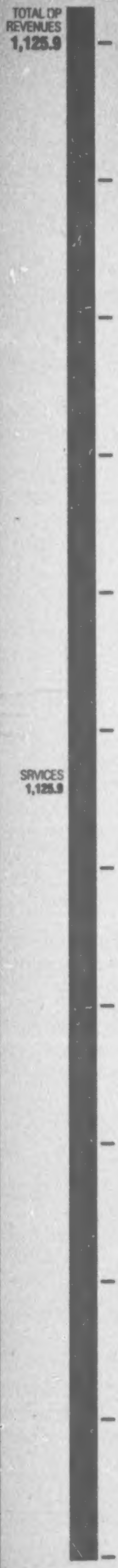
With its nominal privatization and the liberalization of the market on April 1, 1985, NTT was opened to competition from all sides. In the Type 1 telecom category, for companies with their own transmission networks, a number of "new common carriers" entered the fray. These included Japan Telecom, 36% owned by the then-national railway corporation; Teleway Japan, owned by Japan Highway Public Corp. and the Toyota group; Daini-Denden, owned by Kyocera, Sony, Mitsubishi, and others; and Tokyo Telecommunications Network, or TT Net, owned by Tokyo Electric Power, Mitsui, and Mitsubishi. Not needing to subsidize local phone service, these carriers could squeeze NTT by undercutting it on long distance rates.

NTT has responded aggressively. Since the liberalization, it has set up more than 70 new subsidiaries and affiliates, both to enter new business areas and to absorb some excess employees from its bloated work force. On the latter score, it has already managed to pare its payroll to around 300,000 from 314,000 in 1985. It is not just making work, though. NTT International (NTT-I), for example, a joint venture with 10 trading and three engineering companies of which NTT owns 53%, is charged with developing telecom services in the North American, European, Chinese, and Southeast Asian markets. DATAMATION estimates that NTT's dp revenues in 1986 were ¥195.6 billion ($1.16 billion), a 7.5% increase over 1985.

In conjunction with Teleport International of the U.S., NTT-I won an order for the design, construction, and maintenance of a teleport in Jamaica, which hopes to develop an offshore data entry industry for U.S. dp companies. NTT-I also began talks with Electronic Data Systems about a joint venture to provide data transmission services to U.S. companies in Japan and to Japanese companies overseas.

In late 1985, NTT reorganized its R&D bureau into nine telecommunications laboratories structured along market lines.

Revenue figures are in millions of dollars. Each increment represents $100 million.



31

GENERAL MOTORS CORP.

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Detroit, MI 48202
(313) 556-5000

General Motors was a corporate lemon last year, while Electronic Data Systems (EDS) was a veritable money machine. Even record sales of $102.8 billion couldn't stop GM's net income from dropping for the third straight year. This time it plunged 26.3%, to a lowly $2.9 billion, from the previous year's $3.9 billion.

EDS had record sales too, closing at $1.12 billion, a 15% improvement over 1985 and the first time that its non-GM revenue surpassed $1 billion. (Data processing revenues in the DATAMATION 100 do not include revenues stemming from sales by one unit of a company to another. GM contributed $3.25 billion to EDS's bottom line.)

Unlike its parent, EDS's revenue translated into record net income: $260.9 million, 37% above the previous year's all-time high of $189.9 million. Not too shabby for a corporation that lost its heart and soul.

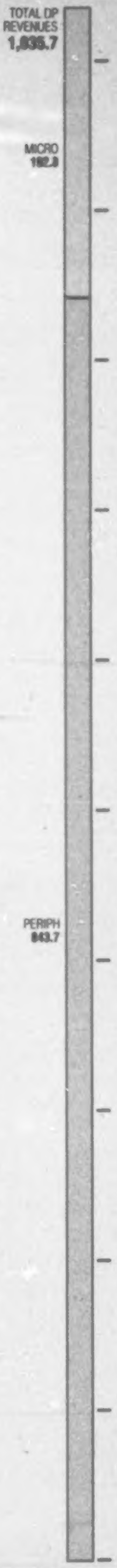
"Ross's [Perot] leaving was an emotional time period," says Les Alberthal, whom GM anointed EDS's president and ceo after Perot's involuntary and expensive departure. "We all grew up together. But we had to put it behind us, and I think by January we had.

"The same management team had been running EDS for a number of years. There wasn't any change in our direction, philosophy, or mission. And Ross's situation didn't have that big an effect either on our bottom-line performance or from a financial standpoint." No lie. EDS continued to rack up big federal contracts, among them deals with the Office of the Secretary of Defense, the Army Corps of Engineers, and the Department of Commerce.

EDS's consolidation of GM's computing facilities and major dp systems continued: there were 14 nationwide information centers at the end of 1986; when EDS started this job in 1984, it had five data centers and GM had 27. EDS and GM completed Dealerline, which automates and integrates every aspect of a GM dealer's operations. And EDS is 40% home in its five-year effort to rewrite, update, and integrate all General Motors Acceptance Corp. (GMAC) dp systems. The task will eventually yield a distributed network linking more than 11,000 GMAC terminals nationwide.

On the factory automation front, MAP (Manufacturing Automation Protocol), GM's pride and joy, took its lumps. A lack of adequate testing facilities made vendors reluctant to manufacture MAP version 2.1 products. Users were equally loath to commit time and money to installing version 2.1 when version 3.0, the last word in MAP, was visible on the horizon.

Revenue figures are in millions of dollars. Each increment represents $100 million.



32

SEIKO EPSON CORP.

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Suwa-shi, Nagano-ken 392, Japan
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Seiko Epson was born on Nov. 1, 1985, of the merger between Seiko watch maker Suwa Seikosha Co. and its overgrown subsidiary, Epson Corp., of dot matrix printer fame. The union came just in time, as sales of watches plunged 16% in 1986 to $460 million (¥77.5 billion), or only 25% of overall revenues, as opposed to 35% of the two companies' combined total the year before. Printers and microcomputers more than made up the difference, increasing 35% to ¥174.5 billion ($1.04 billion) and accounting for 56% of the new company's sales, up from 49% of the previous year's combined figure. Total sales rose 18% in yen over 1985 to ¥310 billion ($1.84 billion).

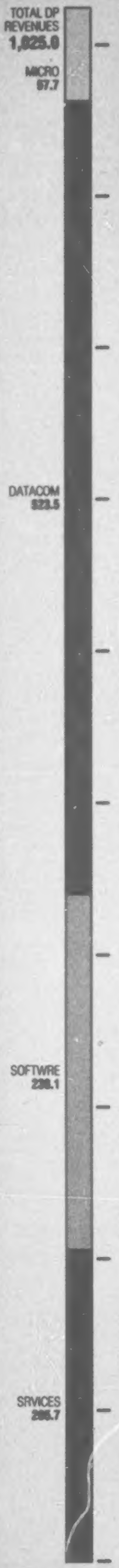
Because overseas sales account for more than 60% of revenues, profits are being squeezed by the rising yen. The company set a goal of doing one third of its production in Japan, one third in overseas consumer markets, and one third in low-cost production areas.

Last summer the company took a big step, opening a $10 million pc printer plant in Hillsboro, Ore. Initial production was 10,000 units per month with two printer and one circuit board assembly lines employing 110 workers; full production of 30,000 per month from five printer lines with 300 workers is scheduled for this year. Plans were also announced for a factory to be opened this year at Telford in the U.K., where Epson's sales of 15,000 dot matrix printers per month account for 46% of the market. It would start out making 8,000 midspeed FX-series printers per month, with eventual expansion to 20,000 per month. Added to the Oregon output, the goal of moving one third of production to overseas consumer markets has been met, at least for printers.

With the expensive yen, U.K. production is estimated to be 20% to 30% cheaper than in Japan. To reduce production costs, a fully automated printer assembly line, using highly accurate robots originally developed for assembling watches, was launched in Hirooka. Yet an automated line in Takaki for 3½-inch floppy disk drives stood idle for much of 1986 due to lack of market demand.

Seiko Epson remains something of a mystery since it is not listed on any stock exchange and does not give out much financial or sales information. It is part of the Seiko group headed by Hattori Seiko Co. Ltd., a trading firm with a number of manufacturing-oriented subsidiaries and affiliates. Seiko Epson's most serious problem may be Epson's history: it is so deeply rooted in dot matrix technology that it has fallen behind in developing laser printers.

Revenue figures are in millions of dollars. Each increment represents $100 million.



33

COMPAGNIE GÉNÉRALE D'ELECTRICITÉ

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75008 Paris, France
(33-1) 45 63 14 14

Compagnie Générale d'Electricité's main objective in 1986 was to acquire ITT's telecom business, and thereby established itself as a world leader in public switching systems.

On Dec. 30, 1986, CGE signed an agreement with ITT to set up a joint company, Alcatel NV, based in Belgium, incorporating all of CGE's computer services, data communications, office automation, and private telephony activities, as well as both groups' public telecommunications interests. CGE has a 55.6% stake in Alcatel NV (21.5% directly and 34.1% through its French subsidiary, Alcatel).

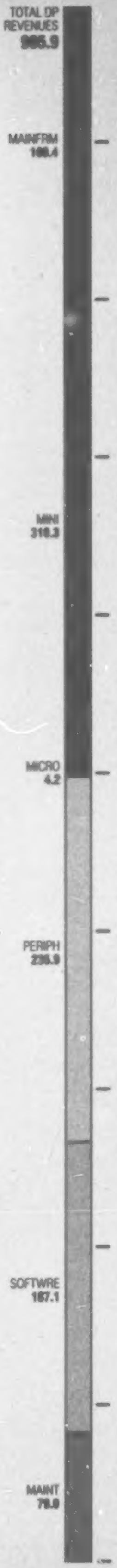
Shortly after this deal was sealed, the French government announced that CGE would return to the private sector by mid-1987, following five years as a state-owned corporation. As newly constituted, CGE is forecasting a jump in revenues to FF130 billion this year from FF80.9 billion in 1986.

All of CGE's dp and telecom interests were previously controlled by its major subsidiary, Groupe Alcatel. Leaving aside Alcatel's revenues from public switching systems, amounting to some FF13.9 billion ($2 billion) in 1986, the subsidiary's total revenues in dp and datacom equipment plus services amounted to FF7.1 billion ($1 billion) in 1986.

Alcatel reports that hardware revenues accounted for 55.9% or FF4 billion ($577 million) altogether, with sales of digital PBXs, videotex, and facsimile terminals by the private telephony division, Telic Alcatel, contributing FF3.2 billion ($461.8 million) of that. The public telecom division generated revenues of FF428 million ($61.8 million) from Datacom Systems, while the office systems division, SMH Alcatel, contributed FF400 million ($57.7 million) from the sale of workstations and micros.

Alcatel controls one of France's top five software and services firms, Générale de Service Informatique (GSI). Its revenues edged up 4.4% in 1986 to FF1.3 billion ($187.6 million). While GSI concentrates on developing managerial application software packages, Alcatel's other major services subsidiary, Société d'Études des Systêmes d'Automation (SESA), is one of the world's leading networking specialists. Its revenues climbed a healthy 21.3% to FF1.05 billion ($151.5 million) in 1986. New contracts include a major project for installing an on-line interbank clearing system. Alcatel has two other small software and service subsidaries: ITIN, which posted revenues of FF375 million ($54 million) in 1986; and Answare, which contributed FF350 million ($50 million).

Revenue figures are in millions of dollars. Each increment represents $100 million.



34

NIPPON UNIVAC KAISHA LTD.

2-17-51 Akasaka, Minato-ku
Tokyo 107, Japan
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Nippon Univac Kaisha Ltd. (NUK) was one of the few Japanese dp companies in 1986 for which prevailing trends in currency and international trade relations were favorable. A strengthening yen meant that the U.S.-made Sperry 1100 series mainframes that form the top of NUK's product line were cheaper to import, while the government's action on Jan. 20, 1986, to remove the last import tariffs of 4.9% on cpus, 6% on peripherals, and 4.9% on parts had a like effect. Added to the fact that the company has no export sales to be hurt by the strong yen, the result was respectable sales growth of 10% to ¥166 billion ($986 million). Consolidated profits were up only 3%, down from an impressive 17% jump the year before.

Orders of 1190 series mainframes were up 15% over the previous year, with 40 new orders in the second half of the year at prices ranging from ¥200 million ($1.2 million) to ¥1 billion ($5.9 million).

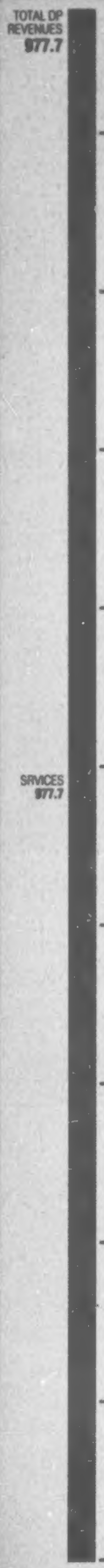
NUK reinforced its strength in the financial and trading industries last summer with the introduction of a "global trading system" software product tailored to the needs of Japanese financial firms setting up branch offices in the major world financial centers. Yamaichi Securities ordered another 1194 for its system in the fall, and NUK has targeted other leading firms for a big sales push. Other notable sales were of an 1192 to All Nippon Airlines and an 1190 to Toa Domestic Airlines, both of which are now expanding their networks.

The midsize Chaparral, oem'd by Oki Univac, was enhanced with CMOS circuits and made more compact; it was renamed the Swift 2200/200 series. NUK introduced a revision of the MAPPER general purpose, fourth generation software product to make "programming for the programless" easier, and Unidraft, an electronic drawing system for manufacturers.

The biggest event affecting NUK was the Burroughs-Sperry merger. Company officials claim that the merger affected them only in that they were spending a lot of extra time reassuring their customers that there would be no changes in their relationships. In the end, say the officials, most customers were positive about the merger, figuring the increased R&D power of the new company would be beneficial.

NUK and the Unisys subsidiary in Japan intend to remain separate entities, mostly because Nippon Univac operated with considerable independence from Sperry. The company is 60% Japanese owned; Unisys and Mitsui are the big holders at 34.2% each, while Oki Electric and Mitsubishi Electric each have 2.5%.

Revenue figures are in millions of dollars. Each increment represents $100 million.



35

COMPUTER SCIENCES CORP.

2100 E. Grand Ave.
El Segundo, CA 90245
(213) 615-0311

Venerable Computer Sciences Corp. went on a buying spree in 1986 to bolster its sales in commercial markets.

These efforts, plus some megacontracts in its bread-and-butter federal government market, boosted the 28-year-old computer services company's revenues by 22% in 1986 to $977.7 million, from $800.7 million in 1985.

The acquisitive momentum started building early in the year when CSC bought Comtec Inc., Farmington Hills, Mich., a services provider to health maintenance organizations. In April, the company committed $235 million to a five-year acquisition program to increase commercial sales. Then it bought up credit bureaus in Iowa, Minnesota, Illinois, and Indiana to bring to 29 the number of credit-reporting operations owned by its Houston-based subsidiary Associated Credit Services. In July, the company bought a $20 million-a-year professional services firm, Computer Partners Inc. of Waltham, Mass.

In a report on the quarter ended Sept. 26, 1986, chairman and president William R. Hoover said commercial markets accounted for the strongest revenue and profit gains: for the quarter ended Dec. 26, commercial markets' revenues increased 50%, compared with 19% for the federal government market.

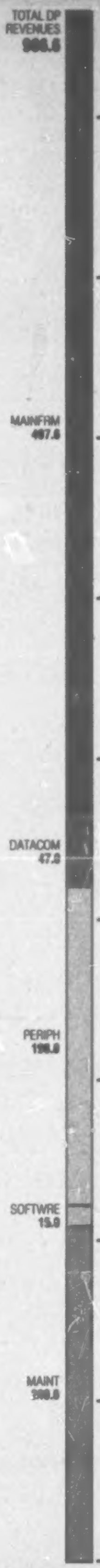
The company's number one market was hardly lackluster, however. In 1986, CSC bagged five big ones—government contracts in the $100 million to $282 million range. This year promises even more. In March, CSC nailed its biggest contract ever, a 10-year contract from NASA for $1 billion, which is expected to augment annual revenues by $20 million.

This would be a big boost for net income, which, in calendar 1986, was $30.3 million, up from $22.3 million in 1985. Corporate assets at the end of the year totaled $588.4 million, up from $463.6 million a year earlier.

CSC's activities are organized in three groups: Systems Group, with primary markets of government agencies and military services; Industry Services Group, with primary markets being credit grantors, tax preparers, and insurance and health care organizations; and Information Network Services Group, mainly multinational and multilocation operations both in business and government. Systems continues to be the strongest but the other two are pulling up.

CSC derived 91% of its '86 revenues from the United States; 2% from the United Kingdom, and 1% each from West Germany, Canada, and the Netherlands.

Revenue figures are in millions of dollars. Each increment represents $100 million.



36

AMDAHL CORP.

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(408) 746-8510

Amdahl Corp. finally got most of its pieces moving in the right direction in 1986, and, by the end of the year, the maker of IBM-compatible mainframe computers had what you might call momentum. For the year, the company came close to joining the billion-dollar club, with $966.6 million in revenues and $41.8 million in earnings. Earnings were 46% better than 1985 earnings of $28.7 million, and revenues were up 12% from 1985's $862 million.

But it was what Amdahl did in the fourth quarter of 1986 that turned some heads. For that period alone, Amdahl had sales of $337 million and earnings of $27 million, both of which were records. That's not to mention a gross profit margin of 43.2%.

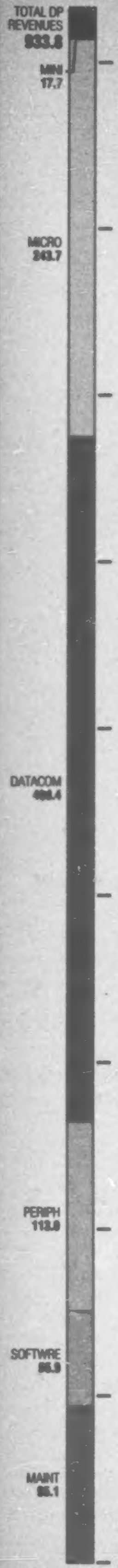
The secret was this: Amdahl started shipping its new model 5890 mainframe computers on time. And the systems performed an average of 10% better than advertised, giving Amdahl a significant price/performance advantage over IBM in the later months of 1986. Although IBM has taken steps to narrow that gap in early 1987, Amdahl had already shipped more than 60 new 5890s by the end of 1986, out of a total of about 200 systems sent out last year. Many of those 5890 systems were shipped with Amdahl's unique Multiple Domain Facility, a software feature that allows users to partition a single processor and run more than one set of systems software simultaneously.

Amdahl's ability to ship the 5890 as promised differed from the company's experience in 1985 with the late and problem plagued predecessor 580 product line. Also contributing to the strong showing was Amdahl's large-scale disk storage product line. The second half of 1986 saw Amdahl begin shipping a new double-capacity 3380-class storage device made by Fujitsu. Altogether for 1986, Amdahl shipped about 500 of the double-capacity 6380E devices and over 5,000 drives and controllers total, accounting for about $198 million in revenue.

In the storage and mainframe businesses, Amdahl was aided last year by a general easing of market pricing pressure. When market leader IBM moderated its practice of cutting mainframe prices an average of 20% per year, Amdahl's profit margins hit a two-year peak.

Going into 1987, analysts were predicting continued success for Amdahl. Early in the year, the company was able to boost memory performance on its 5890 line to keep pace with IBM performance enhancements. And the company said it was on schedule to ship its high-end, 70MIPS 5890 model 600 mainframe in the fourth quarter of the year.

Revenue figures are in millions of dollars. Each increment represents $100 million.



37

RICOH CO. LTD.

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Minato-ku, Tokyo 107, Japan
(81-3) 479-3015

Ricoh is the leading Japanese maker of copiers: it made over 40% of the installed machines in Japan. Although its export ratio at 31% is far lower than the 75% or more of some of its competitors—like Canon—the expensive yen still hurt: revenues grew only 1.6% to ¥591 billion ($3.5 billion), while profits fell 28% to ¥11.4 billion ($67.4 million). A recent increased emphasis on dp products continued to show results, but the 4.1% sales jump to ¥157.4 billion ($934 million) wasn't nearly as impressive as that of 1985, and dp still accounted for only 26.6% of revenues.

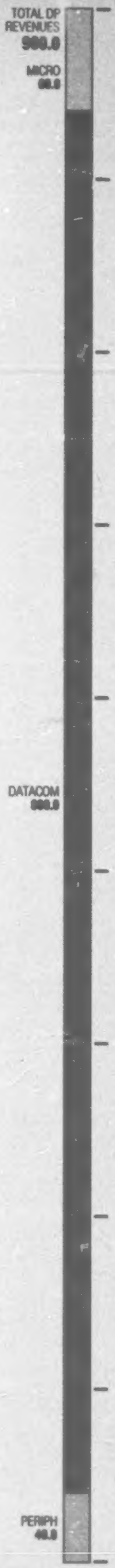
A continued emphasis on increasing dp sales is most likely. Sales of plain paper copiers, the company's cash cow, started moving up during the first part of the year, but then dropped back, and by year-end were off about 4%, accounting for a lower than usual 48% of total domestic sales. The rising yen wasn't a complete disaster, though: Ricoh's export ratio for plain paper copiers is 34%, far lower than the industry average of 80%.

Overseas production of facsimiles began last autumn. Two models of GIII fax machines are being made in the U.K., with a production level of 5,000 per month projected for this year. Facsimile machines turned in the worst performance in the dp category, off 2.6% to ¥59.3 billion ($352 million). The strong growth in this industry has in recent years attracted all the major integrated electronics manufacturers, resulting in downward price pressures and a move to low-end machines. With the total Japanese market down around 3%, Ricoh's performance was slightly better than average. The fax export ratio is at 40%, a bit higher than the overall company average because of an oem tie-up with AT&T. In early 1986, overseas sales fell after an inventory adjustment in the U.S. market, and growth in the segment didn't recover to healthy levels by year's end.

Except for facsimiles, dp revenues were up. Sales of dot matrix printers declined through much of the year, but laser models made up the difference, thanks to an oem contract with Digital Equipment Corp. In October, laser printer production was more than doubled, to over 10,000 per month, resulting in an increase in printer sales of 25% for the year.

Ricoh has not suffered as much as some other Japanese companies from the semiconductor slump, as it specializes in custom and semicustom large-scale integration chips rather than commodity memory chips. Sales were up around 25% to about ¥20 billion ($119 million), and contributed to profits again.

Revenue figures are in millions of dollars. Each increment represents $100 million.



38*

NORTHERN TELECOM LTD.

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It was a year of consolidation for Canada's Northern Telecom. No major new products were introduced, and there was an emphasis on increasing capital. The company continues to hold a lead position in the worldwide digital telecommunications systems market, neck and neck with AT&T.

DATAMATION estimates that NT's total dp revenues remained flat in 1986 at about $900 million, reflecting the mature state of the PBX market. Total company revenues were up a pallid 3% to $4.38 billion, while earnings rose 5% to $287 million (NT reports in U.S. dollars). Sales in the first half of '86 were slow, reflecting price reductions and software problems with its switching equipment. By the fourth quarter of '86, after newly hired engineers had rectified the software problem, sales of the equipment rose sharply, and at year's end, feeling flush, the company bought back some of its common shares and announced a stock split.

While AT&T and IBM/Rolm use direct sales forces to hawk their PBXs, NT increasingly relies on other companies. Last year, the sales and service operations of NT's Integrated Office Systems Division in the West and Midwest were sold to subsidiaries of Pacific Telesis and Centel Business Systems. NT, 52% owned by Bell Canada Enterprises, now operates a direct U.S. sales force only in the Northeast.

Northern Telecom took measures to bolster its performance in the office automation field, forming two strategic alliances in the area. In September '86, together with Apple Computer Inc., NT unveiled some networking capabilities linking Macintosh computers to other manufacturers' computers through the Meridian SL-1 Integrated Services Networks. More jointly developed products can be expected in the future. NT's ties with Hewlett-Packard were strengthened with the introduction of a combined interface/line card, which eliminates data modules between an HP 3000 host computer and the Meridian SL-1.

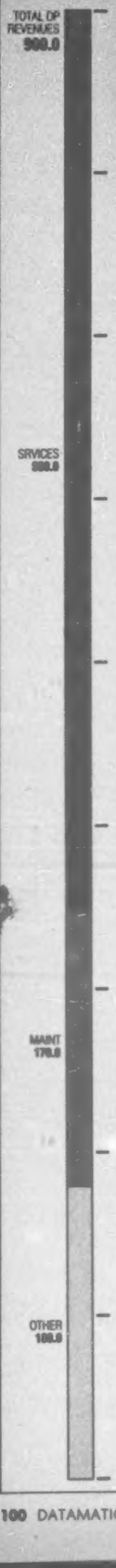
NT made the first simultaneous voice/data call in the U.S. using an actual user application that met ISDN standards. It was done over an NT DMS-100 node in the public telecom network, using NT's Meridian digital telephones and a Meridian M6000 workstation.

In England, Northern Telecom plc was restructured by combining the U.K. Communications Systems and Data Systems divisions and creating Northern Telecom Europe, which now encompasses operations in Europe, the Middle East, and Africa.

*Northern Telecom and GE were tied for 38th place.

Revenue figures are in millions of dollars. Each increment represents $100 million.

← CIRCLE 37 ON READER CARD



38*

GENERAL ELECTRIC CO.

3135 Easton Tpke.
Fairfield, CT 06431
(203) 373-2211

GE continued its meteoric financial ascent, reaping record revenues and earnings. Helped by the June completion of its acquisition of RCA, corporate revenues increased an impressive 26%, to $36.7 billion from $29.3 billion in 1985. Income rose 9% to $2.5 billion from $2.3 billion. But success was not enjoyed in all the company's divisions. Although GE does not provide financial details for individual business segments, DATAMATION estimates that sales for dp operations tumbled to $900 million, a 20% decrease from the previous year's $1.13 billion. The news was even bleaker for the major component of that segment, GE Information Services, (previously known as GEISCO). After revenues had risen 15% to an all-time high of $950 million in 1985, the bottom fell out. GE Information Services sales closed at $550 million in 1986, a 42% decrease. The remainder of the dp revenue was split between Calma, the company's CAD arm, which pulled in $180 million, and GE's and RCA's third-party maintenance contracts, accounting for $170 million.

So what went wrong? Well, life got tougher in the private network fast lane. There was more competition, particularly in electronic data interchange, the pride and joy of GE Information Services. The company committed considerable resources to the sector, including new joint marketing agreements and strategic rethinking of the markets to which the company will commit its resources.

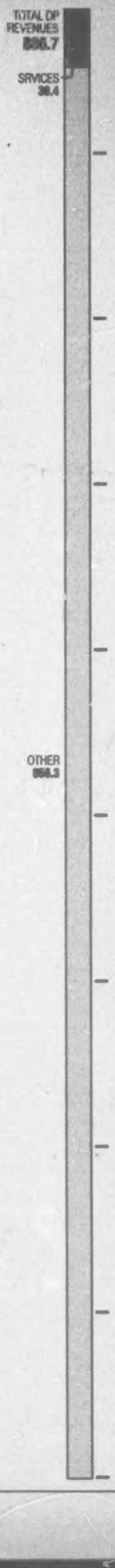
Amidst this, GE Information Services president Walter Williams was kicked upstairs to be senior vp for corporate marketing and sales at GE. The new boss is Anthony Craig, who had been GE Information Services' senior vp of international sales and operations.

GE Information Services had been going international prior to Craig's ascendancy, as indicated by last July's establishment of a software development center in Ireland. Craig accentuated the movement when he signed a joint venture in January 1987 with ICL and a cooperative marketing agreement in March 1987 with Racal-Guardata of the U.K. The ICL combo, International Network Services Ltd., will provide electronic data interchange to companies in the U.K. The Racal-Guardata deal, based on GE Information Services' Money Transfer System, offers new capabilities to prevent technology-based crime in electronic funds transfer.

The company also announced async-to-3270 conversion service and a new pricing structure for MARK*NET, its VAN service offering, and access to Dow Jones News/Retrieval.

*Northern Telecom and GE were tied for 38th place.

Revenue figures are in millions of dollars. Each increment represents $100 million.



40

COMDISCO INC.

6400 Shafer Court
Rosemont, IL 60018
(312) 698-3000

Despite tax rulings that raised Comdisco's costs in its core business of leasing and reselling computers—costs that have continued to rise under tax reform—the Rosemont, Ill.-based firm posted record revenues and operating income for the second straight year.

Total revenues for 1986 were $901.6 million, an increase of 36% from 1985. By comparison, 1985's revenues were up 8% from the previous year. Operating income for 1986 rose 37% over 1985's level, to $79 million. Last year's total income included no extraordinary gains and was slightly off from 1985's $87.5 million, which was boosted by an extraordinary gain of $30 million.

Two thirds of Comdisco's 1986 revenues came from the computer leasing market, in which the company claims roughly a 20% share. Computer sales represent the second major source of Comdisco's revenues. While the company has been expanding both its leasing and sales efforts to include non-IBM equipment, the bulk of Comdisco's customers continue to be Big Blue users. Comdisco is today the largest independent IBM computer leasing company and the largest IBM computer dealer in the world.

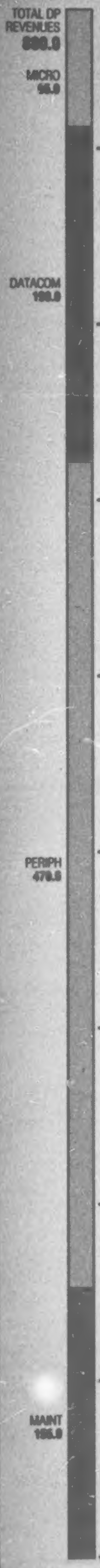
The firm has been dogged with tax difficulties since 1984, when the IRS began a broad review of certain tax shelter transactions that benefited Comdisco's investors and customers. The company subsequently discontinued the disputed deals. In 1986, Comdisco won a favorable ruling for audit years 1980, 1981, and 1982, and paid $6.2 million instead of the more than $200 million the IRS originally sought.

But the tax man's next bite turned out to be much bigger. Early this year, Comdisco paid $65.1 million to resolve an audit for fiscal 1983 and 1984. The company said it had established adequate reserves to cover the payments and that the settlement won't affect earnings.

Meanwhile, Comdisco's ventures in noncomputer capital equipment financing, risk arbitrage, and oil and gas exploration have yet to yield stable returns. The company's fledgling disaster recovery services business got a lift when it helped a Montreal retailer quickly resume normal dp operations after a fire last October, a recovery that received widespread note in the industry. The subsidiary ended last year with over 600 subscribers, the tops in the field.

Some observers see the new tax law creating new problems for Comdisco, but the company actually views it as a plus, claiming it squeezes competitors that had stressed tax benefits over technical expertise and service.

Revenue figures are in millions of dollars. Each increment represents $100 million.



41

ITT CORP.

320 Park Ave.
New York, NY 10022
(212) 752-6000

At the end of 1986, the New York-based conglomerate closed a deal with France's state-owned Compagnie Générale d'Electricité under which ITT sold its worldwide telecommunications operations and related high-tech businesses to a new joint venture named Alcatel NV. While ITT retains a 37% interest in Alcatel NV, the venture is being managed by CGE. Among the $1.25 billion worth of companies ITT sold was the Business Systems Group, representing virtually all of ITT's U.S.-based dp vendors. ITT's final year as a major dp vendor wasn't bad: 1986 revenues for the Business Systems Group grew 16% to $880 million.

ITT's withdrawal from dp closes a history dotted with reorganizations, cutbacks, and few clear successes, particularly in the U.S. Philippe Gluntz, Alcatel NV's chief operating officer, recently stated that the U.S. office automation business it bought from ITT isn't profitable. At the time of the sale, the Business Systems Group included five companies: printer manufacturer Qume Corp.; ITT Information Systems, supplier of the Xtra line of IBM PC-compatible micros; terminal and controller maker ITT Courier; third-party maintenance firm Servcom; and ITT Business & Consumer Communications, a maker of central office telephone switches.

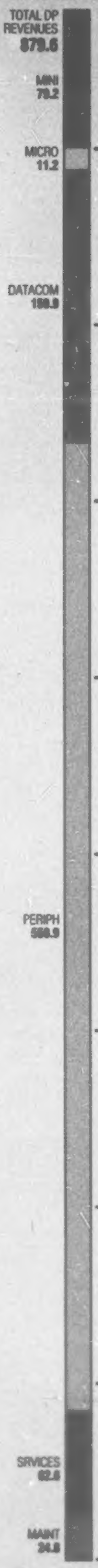
Dp revenues were never vital to ITT, which took in $23.5 billion in sales last year, up 19% from $19.6 billion in 1985. Less than 4% of 1986's revenues were garnered by the U.S. dp companies sold to Alcatel NV. But the rest of the companies spun off in the deal, mostly Europe-based telecom businesses, accounted for 22% of ITT's sales last year.

Since 1979, ITT—formerly International Telephone and Telegraph Corp.—has sold more than half of the 200 businesses it once held. It is now mainly involved in insurance, hotels, financial services, automotive products, electronic components, defense, and industrial technology.

Upon its formation, Alcatel NV, which is currently headquartered in Brussels, Belgium, became the world's second-largest telecom company, after AT&T, with annual sales expected to be roughly $12 billion.

In Europe, the Office 2000 line of voice/data office products will probably benefit from the merging of CGE and ITT telecom customers, but competing in the U.S. will remain difficult. ITT Information Systems, now called Xtra Business Systems, is the pc supplier for the Office 2000 line; it added two high-end micros to its domestic Xtra line last year but still claims just 1% of the U.S. pc market.

Revenue figures are in millions of dollars. Each increment represents $100 million.



42

OKI ELECTRIC INDUSTRY CO. LTD.

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(81-3) 501-3111

It's hard to find any dp industry observers in Tokyo who are optimistic about Oki. The company lost around ¥2.5 billion ($14.8 million) in 1986, with total revenues down 5.8% and dp sales off 30% to an estimated ¥148.2 billion, ($880 million). Losses are expected to continue. Oki's problems go deeper than the general woes affecting the Japanese dp industry. Not only did the company suffer from the appreciating yen and sagging semiconductor and pc-related markets, but it also seems to have positioned itself to bear the brunt of these unfavorable developments. Some analysts say the problem is poor management and they doubt whether Oki will survive without outside help.

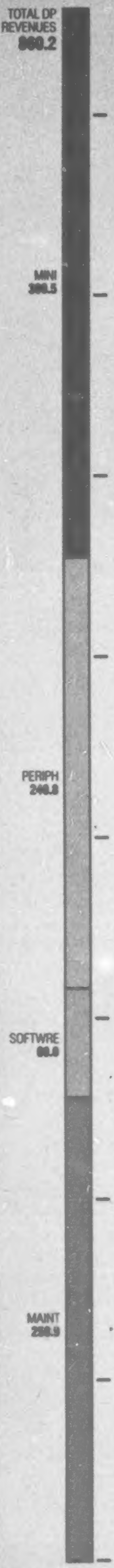
Oki's weakness is the result of an obvious, if unstated, management belief that merely being a Japanese company was one of the most important elements of success. More specifically, it has depended far too heavily on those structural factors that for a long time have given Japanese manufacturers an almost insurmountable edge over their foreign competition. One such factor was the undervalued yen, which permitted the large overseas sales of commodity products that are so necessary for the kind of high-volume, low-cost manufacturing upon which many Japanese companies depend. This was especially important for Oki. Almost 40% of its 1985 sales came from peripherals—those most typical of Japanese commodity export products—especially printers. In semiconductors, 15% of sales, its bread-and-butter item is the 256KB DRAM. At one point in 1986, it was producing some 3 million of these chips per month, the subject of some of the fiercest price-cutting around.

When the yen rose, mere volume lost its magic. Oki's export ratio dropped to 22% in 1986 from 29% in 1985, due, in large part, to lower peripherals sales, which DATAMATION estimates were down 40%. Semiconductor output was also down.

Production of the 256KB DRAMS, for example, was said to have dropped to just 1 million per month, which may have set the stage for Oki's alleged chip dumping that led to trade sanctions this spring.

Domestically, Oki may also have set itself up for a fall. Nearly 20% of its dp business comes from telecom equipment. It depends heavily on NTT, however, relying on it for 16% of total sales. In the past, this would have been an almost certain guarantee of years of profits. Now that NTT is a profit-making entity, however, it is getting tougher with suppliers, even introducing competitive bidding in some cases.

Revenue figures are in millions of dollars. Each increment represents $100 million.



43

PRIME COMPUTER INC.
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Natick, MA 01760
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The key theme of Prime's calendar year was the sacrifice of profitability in order to fuel growth. The 15-year-old company's mission of reaching a critical mass of $2 billion by 1990 called for a "minimum" of 20% growth in 1986. Although the mini maker continued to outgrow the industry—boosting sales a respectable 12%, to $860.2 million—its gain in market share cost plenty. Prime's net income dipped 19%, to $46.9 million. Non-U.S. sales grew a healthy 13% to contribute 42% of all revenues for the year. Business in Europe (about a third of total worldwide revenues) was still strong.

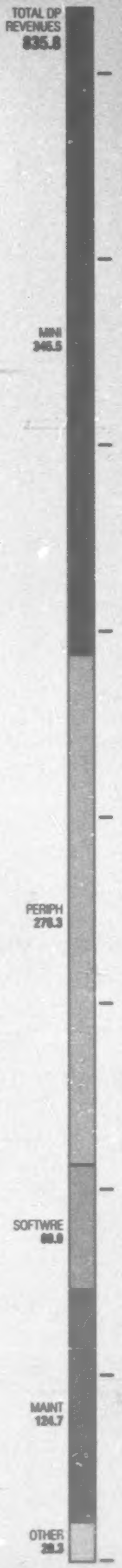
A major disappointment was the CAD/CAM and workstations group. Total sales for the group grew only 10% (compared with 33% the year before), and management announced a restructuring of this pivotal operation. Andrew Knowles, the former president and chief executive officer, was promoted to chairman and given broader planning responsibilities. In as the new ceo and director of the group's daily operations is Robert A. Fischer, a 25-year industry veteran and former chairman of McDonnell Douglas's Information Systems Group. Fischer is expected to spearhead a push into the potentially lucrative computer integrated manufacturing sector.

Despite missing its revenue targets, Prime maintained R&D spending at its 1985 level of 10% to 11%, and continued to invest heavily in new strategic product areas. Future development efforts, insiders reveal, aim at combining the strengths of Prime's proprietary Primos operating system and the more generic Unix. The company entered into alliances with two Mountain View, Calif., startups, MIPS Computer and Silicon Graphics, to build a new high-performance graphics workstation for its CAD/CAM customers. A joint venture with startup Cydrome, Milpitas, Calif., will result in a minisupercomputer for modeling and simulation applications later this year.

Prime took a minority stake in Cydrome and further alliances and acquisitions are being planned; the company doesn't believe it can meet its $2 billion growth target by internal growth alone, and has declined to create its own vertically integrated family of products.

In 1986, Prime finally replaced its five-year-old 2250 with two new low-end office computers, the 2350 and 2450. Also new was a Model II extension to the top-of-the-line 9955 and a replacement for the high-end 9750, the 9755. Both new superminis offered 50% more performance than the computer room systems they replaced, the company claims.

Revenue figures are in millions of dollars. Each increment represents $100 million.



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TANDEM COMPUTERS INC.
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Cupertino, CA 95014
(408) 725-6000

While many of its rivals languished in the continuing industry doldrums, Tandem in 1986 took advantage of hot new products and continued strong growth in a number of important online transaction processing markets to return to something approaching the fast-paced growth rate of its earlier years.

Tandem's profits in calendar 1986 jumped by 148% compared with 1985 levels, climbing to $79.2 million from $31.9 million. Revenues were up 32%, to $835.8 million, with the fourth quarter leading the way.

Tandem president and chief executive James G. Treybig attributes his company's growth to continuing strong international demand and the worldwide increase in the kind of on-line applications that can take advantage of Tandem's fault tolerant NonStop architecture. Also helping was the introduction and shipment of some key new products, including the high-end, gate array-based NonStop VLX and the entry-level NonStop EXT. Sales were brisk for Tandem's new Multilan hardware and software products which allow Tandem systems to communicate along any LAN that supports IBM's Netbios protocols. New products accounted for 75% of Tandem's sales in 1986.

The surge in on-line applications and its new products allowed Tandem to pick up some new "prestige" users in 1986, and the company held its own against challenges in the OLTP market from NCR and Stratus Corp., Marlboro, Mass. For example, Texaco Oil AT in Sweden decided to implement a new point-of-sale application in Sweden, Norway, and Denmark on Tandem systems, and GTE Corp. ordered $40 million worth of Tandem gear for a telephone equipment management system. Tandem also landed a job with the U.S. Air Force Logistics Command.

Tandem's organizational structure went through some changes in 1986. First, the company set up a new Alliance program to encourage development of third-party applications on Tandem hardware, in the process increasing the number of applications running on its systems by over three times, to more than 225 programs. Tandem also set up a "new ventures" office to create joint venture relationships with outside companies. Among the deals signed so far are ones with PacBell of San Francisco and the Volmac Group of the Netherlands.

As 1986 ended, Tandem laid plans to repeat its new product successes, introducing an SQL-based distributed DBMS and adding low-end Unix- and CMOS-based offerings to fend off pressure from IBM, NCR, and others.

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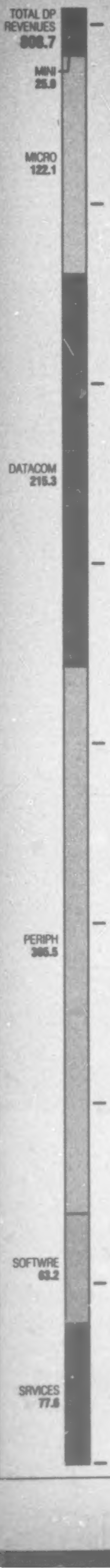

45

C. ITOH & CO. LTD.

5-1 Kita-Aoyama 2-chome
Minato-ku, Tokyo 107, Japan
(81-3) 497-7293

C. Itoh, one of the top three Japanese trading companies, is considered the most vigorous of all of them. Fortunately, it hasn't relied too much on dp sales—about 1% of total revenues—to prop up the bottom line. Dp was down 19% in 1986 to ¥136.3 billion ($809 million). Overall revenues were down 4.6% to just over ¥14.8 trillion ($88 billion). C. Itoh is weathering the escalating yen better than most Japanese companies, since almost 45% of its transactions are purely domestic, and about 17% involve imports of such items as oil, forest products, metal ores, and foodstuffs, for which costs have dropped sharply. Around 20% of transactions are offshore, leaving exports accounting for only 18.6% of revenues.

In dp products it's a different story, though. The biggest money-maker in the category is peripherals. Most of these products are manufactured by companies like Tokyo Electric to C. Itoh's specifications; the company commits to buy a certain amount, and partially finances the purchase of production machinery. The problem is that a full 80% of the peripherals is exported. The company estimates it has almost 8% of the U.S. printer market, for example, and it also does well in monitors, floppy disk drives, and terminals. U.S. peripherals sales were off 50% or more in 1986 due to the weakness of the dollar against the yen, while domestic sales were flat. Although the company is trying to shift some sales to Europe, results so far have not been encouraging.

The rest of the dp picture was not quite so bad. Dp products are actually produced by two divisions of Machinery Group No. 3, the electronics division and the aerospace and electronics division. The group itself isn't doing badly: 1986 sales were $4.2 billion (¥700 billion), up about 14%. Its response to poor dp sales has been to "have a lot of meetings" to figure out how to shuffle personnel into the more promising sections. One such area will be facsimile machines. The company expects fax sales to double in 1987, in light of a booming U.S. market. Sales are less sensitive to the exchange rate because 90% to 93% of all faxes are made by Japanese manufacturers, all of whom must cope with the same yen rates.

In May, the company signed some notable import pacts, agreeing to market through C. Itoh Data Systems the fault tolerant systems of Stratus Computer, and the minisupercomputers of Culler Scientific Systems. No machines of either type were sold in 1986. It also signed an agreement to market Texas Instruments' Explorer AI workstation through CRC.

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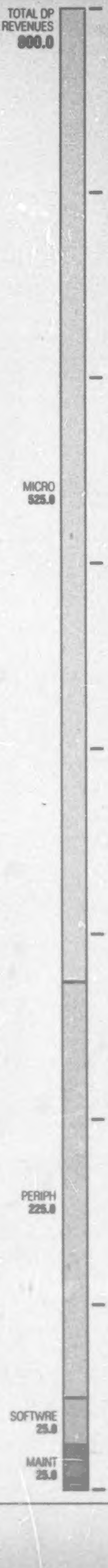

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COMMODORE INTERNATIONAL LTD.

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After five quarterly losses totaling $274 million, Commodore edged back into the black during 1986. Cost-cutting, including a one-third reduction in payroll, the closing of three plants, and heavy write-downs of inventory, accounted for the return to profitability. Company officials and analysts have been optimistic, saying Commodore is now in the midst of a turnaround. But the future is still far from assured.

The company's many difficulties include tough competition in the marketplace; pricing pressures; the slow recovery of the pc market; the company's own debt problems; and chaos in the executive suite.

Profitability came midyear, when the company posted $1.2 million in earnings in its fiscal year fourth quarter ending June 30. (The company had a loss of $124 million in the corresponding quarter a year earlier.) Commodore showed a loss of $10 million for the calendar year, compared with a loss of $237.2 million in 1985. Revenues were up to $837.7 million compared with $798.6 million in 1985. During its period of heavy losses, Commodore took inventory write-downs of $93 million and factory closing charges of $22 million.

Bankruptcy rumors, rampant in 1985, continued in 1986, although they were muted somewhat when the company renegotiated a $135 million loan agreement with its lenders.

The company has been a leader in the low-priced personal computer market and is trying to build a new, higher-priced business based on the Amiga computer, which it introduced last year.

Although praised for its technology, sales of the machine have been slow because of a sluggish market and lack of software. Commodore officials assert that sales have picked up, and that another, enhanced version of the machine will soon appear.

Overseas sales of Commodore's IBM PC-compatible models were a major contributor to profits. Sales of the company's low-end Commodore 64 and 128 were flat. Meanwhile, the company rolled out a few new products early this year, including two low-cost XT compatibles and a sleeker version of the Commodore 128.

Thomas J. Rattigan, named chief operating officer in March 1986, did much to cut costs and improve business, but his tenure lasted little more than a year. In April, he and several other executives were ousted. Rattigan files a $9 million damage suit against the company, and is said to have a five-year contract that guarantees him $3.6 million.

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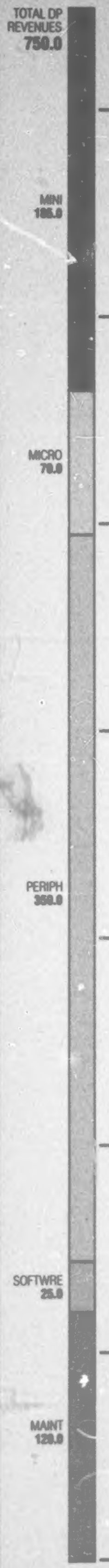

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TEXAS INSTRUMENTS INC.

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Cutting and slashing, Texas Instruments put its digital products group—and the company as a whole—back in the black in 1986 and still had enough energy left over to introduce a new line of midrange computers for the multiuser market.

Things had already begun to change at TI in 1985. With losses mounting each quarter, the company cut more than 8,000 jobs from the payroll, shutting down excess production capacity, and changing management. Jerry R. Junkins, an electrical engineer who had been with the company for years, took over as president and chief executive officer from J. Fred Bucy, who took early retirement. In 1986, it all came together. While sales remained flat at $4.97 billion, the company earned a profit of $102 million.

The biggest increases in both sales volume and earnings came in the defense electronics business, which showed a profit of $210 million on sales of $1.72 billion. Sales of semiconductors, which now account for just over 40% of revenues, remained flat but profitable, a result of the massive reductions in production costs.

The biggest turnaround came in the digital systems group, which sells computers and peripheral products as well as calculators and industrial control systems. While sales actually fell 7% to $931, the company turned a profit of $28 million. DATAMATION estimates that sales of TI's computers and peripheral products remained the same at about $750 million.

The new computers introduced in 1986, the TI System 1000 series, operate in the Unix environment. That's a real departure for TI, which in the past has offered only systems that run a proprietary operating system. The high-end System 1500, which can handle from 32 to 125 users, was introduced in the spring of 1986 and has since been followed by the smaller Systems 1100 and 1300, which can handle from two to 32 users. TI is selling through a network of vars targeted at the health care, automotive, and banking markets.

Because some of the worst mishaps in the company's history—digital watches, home computers—originated in the digital products group, any new product thrust is viewed with some trepidation. But instead of trying to make a splash in broad markets with high revenue potential, TI now focuses on well-defined markets in search of profitability. Analysts have praised the new strategy, while noting that the market for midrange, multiuser computers is not lacking for competitors.

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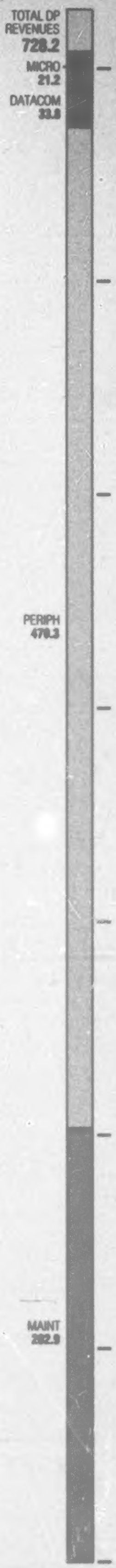

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TELEX CORP.

6422 E. 41st St.
Tulsa, OK 74135
(918) 627-2333

Telex has thrived in the tortuous 3270 terminal market. Unfortunately, in 1986 IBM went on the warpath: although sales of all of Telex's computer products were up 22% in 1986, sales of terminals and controllers were up less than 10%. Net income, which grew by over 40% in each of the last two years, was up only 9% to $72.8 million.

Price-cutting of about 10% a year is common in the 3270 terminal market, but IBM isn't sticking to that rule anymore. IBM slashed prices on its existing product line and introduced its new 3191 terminal at $1,200, about 28% below previous models. Big users who bought in bulk got a considerable discount off the list price.

All this price-cutting is taking place in a maturing market. Sales of 3270-compatible terminals grew 11% in 1986, but the dollar volume slipped to $1.42 billion from $1.48 billion. While IBM has some 58% of the market, Telex is in second place with 16%. The other major competitors are ITT Courier, AT&T Teletype, Memorex, Lee Data, and Harris.

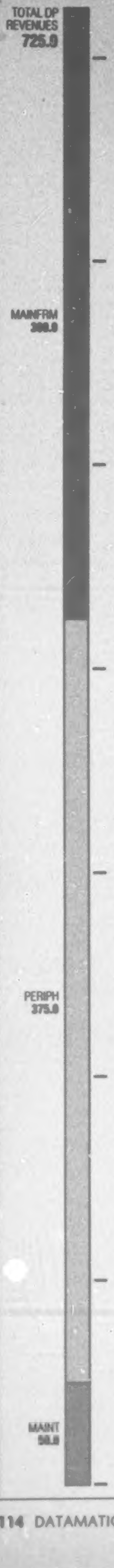
Telex counterattacked with its own 3191 terminal. It also came out with a new series of airline reservation terminals, a voice data terminal, and a series of terminals and printers for IBM Systems/36 and 38, its first appearance in that market.

Telex management was optimistic that the Telexecom PBX division, acquired at the beginning of '86, would become profitable right away and make a substantial contribution to earnings and revenue. Telex is eager to establish itself as a company that knows how to merge voice and data communications. But integrating the PBX operations proved tougher than expected, and revenues of $34 million in 1986 were considerably below expectations.

Telex continued to invest heavily in automated facilities. The Telex 3191—like its IBM counterpart—is built in an automated factory in Raleigh, N.C. The company's new automated distribution and repair facility in Tulsa also began operation in 1986. In addition, Telex continues to invest heavily in new products. R&D earmarked for new computer products was up 30% to $40 million.

Telex's primary strategy for dealing with the price-cutting and maturation in the 3270 terminal market is to target niches. That's why it acquired its PBX division from United Technologies in 1986 and its airline reservation business from Raytheon in 1984. In 1986, Telex also sold $21 million worth of its new IBM-compatible pcs.

Revenue figures are in millions of dollars. Each increment represents $100 million.



49

NATIONAL SEMICONDUCTOR CORP.

2900 Semiconductor Dr.
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(408) 721-5000

Continuing strength in National Semiconductor Corp.'s National Advanced Systems (NAS) plug-compatible mainframe business could not counterbalance a slump in the merchant semiconductor business.

Bottom line result: losses of $53.6 million on sales of $1.68 billion. Most of National's loss came as the company's main chip product line, bipolar circuits, felt increased competition from low-priced Japanese parts. National's 1986 sales were up only 4% from 1985's $1.61 billion.

NAS, which resells IBM-compatible mainframes and disk and tape drives manufactured by Hitachi Ltd., was profitable with the help of a new generation of Hitachi hardware and the lack of significant new product or pricing pressures from IBM. Revenues in 1986 of NAS and another subsidiary, Datachecker, a manufacturer of point-of-sale terminals, were up 11% over 1985 to $725 million.

NAS in 1986 made a successful transition to the AS/XL mainframe line. Based on high-density, high-speed Hitachi emitter-coupled logic, the air-cooled, six-model AS/XL family promised performance at least equal to that of the IBM 3090 mainframe line—often with cost, space, and energy savings.

The dual-processor AS/XL 50, 60, 70, and 80, competing with IBM's 3090 Models 180 through 300, began shipping worldwide in July. By the end of the year, NAS had shipped over 40 AS/XL mainframes.

Following IBM's January 1987 move to improve 3090 price/performance, NAS added to the performance of the AS/XL line by introducing faster, denser memory technology. NAS also promised to accelerate initial shipment of the three- and four-processor versions of the AS/XL and leapfrogged IBM by adding a 6MBps channel capability to the mainframe.

Following a January lag in orders related to the IBM performance boost announcement, NAS said AS/XL demand had returned to normal.

NAS scored in the pcm large-scale DASD market: its Hitachi-built 7380 Model E was one of the first double-capacity disk storage devices shipped by a vendor other than IBM. By the end of 1986, analysts estimated NAS's share of the huge 3380-class disk market at 6%.

National Semi's president and chief executive Charles Sporck has predicted "continued modest improvement" in the company's semiconductor business in 1987 and continued strong growth in the pcm computer business. But NAS faces a wave of user fear and uncertainty as the threat of a trade war with Japan grows.

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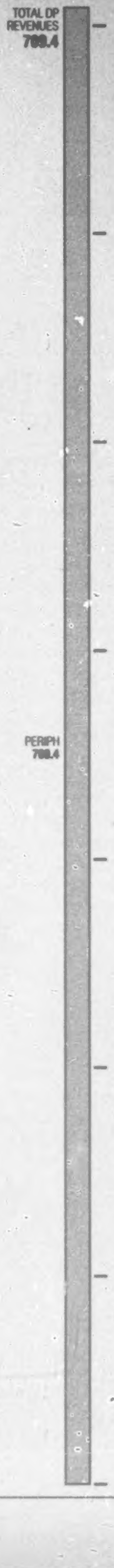

50

SEAGATE TECHNOLOGY

920 Disc Drive
Scotts Valley, CA 95066
(408) 438-6550

Seagate Technology in 1986 made Wall Street and its investors forget all about 1984 and 1985 when prices were down and profits were slim or nonexistent.

In 1986, the maker of small rigid disk drives for personal computers reestablished itself as the number one drive supplier for the IBM PC and significantly increased its sales through value-added resellers and dealers. As a result, Seagate's sales more than doubled, to $709.4 million. At the same time, Seagate drove down costs by continuing to increase offshore drive manufacturing, and reported a record profit of $90.4 million, a stunning figure compared with its 1985 profit of $8.7 million. By the end of 1986, Seagate had managed to achieve a gross profit margin of 29.5%, its best in four years.

Even Seagate officials have been surprised by the dramatic turnaround at the company, which in 1985 produced an actual operating loss of $12 million, before tax benefits. "If we had been asked a year ago how large we'd be today, we would never have dreamed we'd be operating at $1 billion a year in sales this quickly," said Seagate treasurer David Drennan after the company's December quarter results were announced.

A big reason for the surge was Seagate's increased value-added reseller and dealer business. In 1985, resellers and dealers accounted for about 5% of Seagate's sales. By mid-1986, that portion had increased to about 55%.

IBM continues to account for the greatest share of Seagate's business, though. At the end of 1986, sales to IBM, primarily of Seagate's 5¼-inch drives, accounted for about 30% of the company's sales.

If IBM's new PC announcements are any indication, however, Seagate may soon see a decline in its business with Big Blue. All the new IBM Personal System/2 designs include 3½-inch rigid disk drives, most of which IBM is making itself or purchasing from oem vendors other than Seagate. Seagate did not announce its own 3½-inch drives until early in 1987, and analysts don't expect sales of those drives to show up on the Seagate sales line until mid-year. Meanwhile, the company continues to enhance its 5¼-inch drive line, increasing capacity and bundling intelligent controller capability together with the drive itself.

In 1986, Seagate added a total of 147,000 square feet of production space to its facilities in Bangkok and Singapore. By the end of 1986, 10,100 of Seagate's 11,872 employees were outside the U.S.

Revenue figures are in millions of dollars. Each increment represents $100 million.

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STORAGE TECHNOLOGY CORP.

2270 S. 88th St.
Louisville, CO 80028
(303) 673-5151

A trimmer Storage Technology Corp. took some important steps on its road back from Chapter 11 and near ruin, and the company has predicted it will emerge from bankruptcy this year.

After three years of losses totaling $603.8 million, the maker of IBM-compatible disk and tape storage devices turned a profit in 1986, reporting net earnings of $36.2 million.

StorageTek made progress on the product front, introducing a couple of significant new tape drive offerings and finally achieving volume shipments of its key 8380E pcm disk storage device. Cutting its worldwide employee count to 8,400 from 15,000 helped StorageTek return to profitability; so did continued access to investors' and creditors' dollars—between $650 million and $800 million in cash, equity, and notes—that the company will have to pay out as soon as it leaves Chapter 11.

Through bankruptcy, StorageTek continued to invest research and development money in new products—$68.5 million in 1986 (in 1985 it spent $65.5 million). The result early this year was the introduction of a StorageTek 3480-class cartridge tape drive and an automated cartridge tape library to go with it. StorageTek hopes to become one of the first pcm suppliers of a 3480-class drive when it starts shipping its own 4480 product this quarter. And the company hopes to whip up interest in what it calls "nearline" storage, a $250,000 tape library positioned between on-line disk and off-line tape. While critics call the library too expensive, unproven, and unnecessary, StorageTek says it expects to ship as many as 6,000 tape libraries over the next five years, beginning in 1988.

Meanwhile, in 1987, StorageTek must rely on the strength of its existing products—nine-track tape drives, 3380-class disk devices, nonimpact printers, and solid-state storage devices. While it continues to command the lion's share of the market for solid-state storage devices, it fell behind IBM and lost ground to pcm competitors National Advanced Systems and Amdahl Corp. in the 3380 DASD market. By late 1986, however, StorageTek was shipping its 8380E drive in volume.

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MOTOROLA INC.

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Schaumburg, IL 60196
(312) 397-5000

Motorola's semiconductor sales rose 9% in 1986 to $1.88 billion, after a disastrous 23% plunge the year before. The recovery helped Motorola report $5.89 billion in sales, a record high, up 8% from $5.44 billion in 1985. Earnings were $194 million, well more than double the $72 million profit the company made in 1985.

Data processing sales slipped, however, due to a 17% decline in sales to $229 million by Motorola Computer Systems. Formerly Four-Phase Systems Inc., the subsidiary was purchased four years ago for $250 million. The Information Systems Group, which makes modems and related communications equipment, did better, with sales rising 9% to $465 million.

Although the computer operation has lost money for four consecutive years, it is unlikely to be abandoned, as it constitutes a substantial market for other Motorola products. For example, two supermicrocomputers it introduced last year—the Vision/32 and the System 8000—use Motorola's 32-bit chip (MC68020), its VME bus architecture, and the Unix V/68, Motorola's version of the widely used AT&T operating system.

Edward F. Staiano, a senior manager, was assigned late in 1985 to oversee the operation, which had been left pretty much on its own since being acquired.

Staiano trimmed the work force, reduced manufacturing and overhead costs, and focused the company on minicomputer and microcomputer lines. Beyond adding the Vision/32 and the System 8000, the company beefed up its Series 5000 computers and introduced personal computer connectivity products based on the System 8000. To expand overseas markets, Philips International will distribute Motorola computer products in Europe.

In the Information Systems Group, Codex last year introduced a half dozen products, including the 2250 and 2260 Series V.32 modems for the dial-line market. Other introductions were the 6003 intelligent network processor, a point-to-point statistical multiplexor that supports up to eight asynchronous terminal ports, and the 4255 SNA Gateway, a cluster controller and protocol convertor.

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MARTIN MARIETTA CORP.

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The information systems piece of Martin Marietta Corp. saw the future, and it wasn't in packaged software, so it sold its packaged program products to On-Line Software International Inc.

Not that the other pieces of the primarily aerospace company were anything to write home about. Corporate revenues did rise to a record $4.75 billion, a 7.7% increase over the previous high of $4.4 billion in 1985, but net income fell 18.8% to $202 million.

At least the company made money. All Martin Marietta Data Systems (MMDS) did was cut its losses and run. MMDS's sales jumped 8.7%, to $467.4 million from $429.9 million. That undoubtedly contributed to losses of only $3.7 million, compared with the previous year's $10.3 million.

On-Line, strictly a telemarketer until this move, paid $35 million for MMDS's RAMIS II, UFO, Consensus, and Unison products. MMDS retained the custom application software and services marketed in support of MMDS's primary systems business, principally Modular Application System (MAS) software and the Orlando 4000 data center computer services. MAS includes manufacturing, financial, and personnel application packages.

The sale marked the end of MMDS's attempt to restore RAMIS II to the glory days of the early 1980s. The product had been the market leader when MMDS bought it in 1982 from Mathematica. But as MMDS's emphasis shifted to systems integration and information systems in the federal sector, RAMIS II slipped behind Focus and has trailed badly since 1984.

Those negative vibes may have been reflected in yet another presidential shuffle. Patrick J. Zilvitis, who had been head of MMDS since October 1985, was replaced in January 1987 by Frederick Hudoff, who had been vice president in charge of the corporation's air traffic control division.

Outside the U.S., Hoskyns Group Ltd., MMDS's international subsidiary based in London, strengthened its position as one of the leading computer services companies in the U.K. It was a major hit when MMDS took it public on the London Stock Exchange at the year's end and sold a 25% interest in it.

54

COMPAQ COMPUTER CORP.

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Being an IBM clone company is really very simple: copy whatever Big Blue is doing, add some bells and whistles, keep your prices down, and wait for the orders to come in. By doing all of this just right, Compaq's 1986 revenues grew 24% to $625.2 million. While that represents a leveling off of the steep trajectory Compaq's been on since its founding in 1982, it is still a handsome performance by any standard. Earnings soared 61% to $42.8 million.

Lately, however, Compaq has been acting less like a clone and more like a company that wants to set its own standards. In 1986, Compaq jumped ahead of IBM—and everyone else—by introducing the Deskpro 386, a personal computer based on Intel Corp.'s 80386 microprocessor. Compaq also beat IBM to the punch with two AT-compatible computers that use a speedier version of the Intel 286 chip.

These new high-end products are an important part of Compaq's business strategy. Compaq wants to distinguish itself from the pack of low-cost IBM clones on the market by offering products that are at the leading edge of pc technology. (These high-end products also have the highest profit margins.) At the same time, it can't stray far from the IBM standard. So far, Compaq doesn't seem to be having any problems. Some 12,000 Deskpro 386s were snapped up in the final quarter of '86, exceeding company expectations. Sales of all high-end products—the Deskpro 386 and the AT-compatible computers—accounted for about 72% of Compaq's revenues in the final quarter.

With international sales up 100% over 1985, Compaq announced that it was planning to build a $23 million manufacturing facility in Erskine, Scotland. Beginning this year, the company also intends to assemble printed circuit boards in Singapore.

Becoming a worldwide company may strain Compaq's hard-won operating margins, as will the cost of maintaining compatibility with IBM. Compaq put $26.5 million into R&D in 1986, a $10.6 million increase over 1985.

55

INTERGRAPH CORP.

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Intergraph Corp., the number two company in the CAD/CAM business behind IBM, had a respectable 15% revenue gain, to $605.7 million last year, and a 4% increase in earnings to $70.4 million.

Product announcements were encouraging: early last summer, Intergraph introduced two workstations—the InterPro 32C and the InterAct 32C—using Fairchild Semiconductor chips with five times the performance of Motorola 68020 chips being used in competitive systems. The company is introducing advanced versions of the workstations, with products called the 32C Extended and the InterPro II. These products signal Intergraph's expansion into a generic workstation market where it will compete with Sun Microsystems, Apollo Computer, Digital Equipment Corp., and others.

Intergraph, founded in 1969 as a software company, only recently began to offer full systems. Its products address three categories: mapping and earth sciences; architecture, engineering, and construction (AEC); and manufacturing, including design and manufacture of mechanical and electronics products. AEC and mapping made up 55% of its sales, mechanical accounted for 36%, and electronics 8%.

Intergraph generates more than a third of its revenues outside the U.S. It operates sales offices in 12 European countries and 17 other nations. It announced plans to build manufacturing and distribution facilities in the Netherlands to boost its European revenue, which was $68 million last year.

The company's data processing systems are based on DEC's VAX and MicroVAX II central processors. The latest generation of its own line of workstations function both as standalone engineering workstations and as terminals connected to a host system. Until the company begins to offer Unix-based applications software, however, nearly all of its new line of workstations will be used as terminal emulators for VAX-based systems.

56

CRAY RESEARCH INC.

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Cray installed 35 systems in 1986, up from 28 the previous year. Of the new installations, 29 were purchased, five were leased, and one was installed within the company. Cray now has an installed base of 148 machines worldwide, 10 of which are internal installations. Revenues for the year were $597 million, up 57% over the previous year—not quite as good as 1985's 66% growth. Net earnings were up 65%.

In August, the company announced a 12% improvement in cpu performance and price reductions on all one- and two-processor Cray X-MPs. The company improved the clock speed of the X-MP from 9.5nsec to 8.5nsec and dropped prices by $1 million, a 20% reduction. Two new models are the $7 million Cray X-MP/22, with two cpus sharing 2 million words of memory in 16 banks, and the $12 million X-MP/44, which has four cpus sharing 4 million words of memory in 32 banks.

The company introduced an entry-level system called the X-MP/14se, with one cpu and 4 million words of memory. The company claims it gives 80% of the performance of the high-end X-MP/14 at less than half the price: at $2.5 million, it is the least expensive Cray.

These announcements represent a shift in strategy for Cray, which until last year had always focused strictly on the high end of the market. Recognizing that it is no longer the only supercomputer game in town, particularly for low-end systems, Cray has responded to market demand for cheaper, smaller supercomputers.

Products in the works include the Y-MP, a follow-on to the X-MP, expected to be released in 1988; and the Cray-3, which will use Cray-produced gallium arsenide chips, and is expected to appear in 1989-90. Robert Ewald, vp of communications marketing, says Cray will make Unicos, the company's Unix-like operating system, available on all products within the next few years.

Since Cray now addresses a much broader customer base, the company is more susceptible to economic factors. The oil slump, cutbacks in federal funding for supercomputer centers and defense, and competition from Japan Inc., particularly outside the U.S., will all affect Cray in the coming year. Analysts predict a 30% revenue gain in 1987—still healthy, but diminished from the phenomenal growth in the past.

57

LOCKHEED CORP.

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Lockheed Corp. launched itself into the DATAMATION 100 this year, becoming the third aerospace company on the roster. The August acquisition of Sanders Associates Inc. skyrocketed the company's dp revenues to $551 million, up from $113.3 million in 1985.

California Computer Products (CalComp), Sanders' Anaheim, Calif., computer graphics subsidiary, helped fuel Lockheed's dp ascent. Now part of the parent company's Information Systems Group (ISG), based in Burbank, Calif., CalComp contributed an estimated $335 million to dp revenues.

Profits for ISG reached $10.2 million in '86, up from $3.7 million in '85. Over half—$6.2 million—of the group's '86 net income was garnered in the fourth quarter, after CalComp arrived in the ISG hangar. CalComp revenues, plus a turnaround at ISG's Metier Management Systems, accounted for a return to profitability for ISG.

Inspired by Sanders' defense electronics business, Lockheed bought the firm for $1.2 billion in a friendly takeover, a white knight rescue after Loral Corp. had made a hostile offer of $875 million. It was CalComp, however, that provided Lockheed with synergy—that elusive goal of every merger.

Where CalComp fits in so well is with ISG's CADAM Inc., a Burbank computer aided design and manufacturing software producer. Their product lines complement each other. In fact, the two firms share some customers. Thus far, they've been working together closely while maintaining separate businesses under the ISG wing.

ISG was formed in 1982 when Lockheed reorganized. In addition to CalComp, CADAM, and Metier, ISG includes Dialog Information Services Inc., Palo Alto, the world's biggest on-line data service; Datacom Systems Corp., Teaneck, N.J., a supplier of dp services to state and municipal governments; Lockheed DataPlan Inc., Los Gatos, Calif., which provides computerized weather advisories and other domestic and international flight services; and Lockheed Aircraft Terminals Inc., Burbank, an airport management and computer systems firm for commercial airlines' in-flight operations.

58

ZENITH ELECTRONICS CORP.

1000 Milwaukee Ave.
Glenview, IL 60025
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Computers were a bright spot during an otherwise lackluster year at Zenith. Total corporate revenues were up 16% to $1.9 billion, with sales of Zenith's pcs accounting for most of the increase. Sales of tvs and VCRs, the company's main business, grew only 6%, with heavy competition from Japan and South Korea keeping prices down. Despite a profitable second half, Zenith ended 1986 losing $10 million.

Nonetheless, Zenith Data Systems had plenty to cheer about in 1986. First was the $242 million contract to supply Zenith's AT-compatible Z-200 pcs to the military. Then the IRS chose Zenith over IBM to supply portable computers under a $27 million contract. Zenith won that job with its highly popular Z-171 laptop; its sales have made Zenith number one in the laptop market. In October, Zenith received an 18-month renewal of its contract to supply eavesdrop-proof versions of its pcs to the military.

Sales of computers actually grew 56% to $548 million. High first-year costs associated with meeting the government contracts kept earnings down at the data systems division, as did expenditures on new product development. During 1986, Zenith came out with a new laptop, the Z-181, as well as its first 32-bit micro, the Z-386. The company also continued spending heavily on the development of "flat tension mask" technology for its video displays. Because the face of the tube is flat, it is virtually free from glare and reflection. Zenith is promising that brightness, contrast, and resolution will be far superior to conventional crts now on the market, without much additional cost.

Buoyed by the success of its computer products, Zenith has revamped its approach to distribution. After placing virtually all its emphasis on volume sales to corporate accounts, universities, and government agencies, Zenith is now going after the retail market. Early this year, Zenith decided to scrap its network of 18 distributors and deal with retailers directly through five warehouses around the country.

59

ARTHUR ANDERSEN & CO.

69 W. Washington St.
Chicago, IL 60602
(312) 580-0069

The same year we all liked Ike, Arthur Andersen did its first dp job, a payroll system for General Electric. Thirty-four years later, Arthur Andersen's 1986 dp revenues broke the half-billion dollar barrier, settling at $546 million, up 32% from 1985's $414.7 million. Overall, Andersen's Management Information Consulting Division revenues—which include strategic planning, studies, and training as well as dp—were $635.9 million. But Arthur Andersen's fame as an accounting firm still outweighs its dp and consulting clout, and in 1986 the firm's total revenues were just over $2 billion, up 20% over 1985.

Mel Bergstein, managing director of Management Information Consulting, says the company is handily exceeding its planned dp growth of 15% per year in hours billed to clients. Its dp business easily beats its competitors among the other Big Eight accounting firms: Andersen's dp revenues equal those of the other seven combined.

Unlike many other companies in the dp business, Andersen is adding staff. Last year, the Management Information Consulting Division's employee population rose to 11,008 from 1985's 9,407. Among them, Bergstein says, 9,000 are doing dp.

Andersen earns 70% of its consulting revenues in North America; 22% in Europe, including Ireland and the U.K.; 5% in Japan, Australia, and East Asia; and the remaining 3% in the Middle East, Africa, and Central and South America.

Its software products include MAC-PAC, a manufacturing package for IBM mainframes, designed to regulate the process from design engineering through scheduling and shop floor control. MAC-PAC/D is a specialized version of the system for defense contractors. MAC-PAC/38 runs on IBM's System/38 and adds distribution and financial systems to the mix. DCS is a distribution system that handles order processing, inventory control, warehouse management, and accounts receivable.

60

BASF AG

Carl-Boschstrasse 38
D-6700 Ludwigshafen, West Germany
(49-621) 601

BASF Data Technology, the dp subsidiary of the West German chemical giant BASF, turned in an 8% sales gain, reaching revenues of DM1.13 billion ($520.7 million) in 1986. Nearly three fourths of those revenues came from mainframe and peripheral sales, with the remainder generated by the company's magnetic media business.

The year's biggest change came in November 1986, when BASF announced the merger of its Hitachi-based pcm operations with Siemens' Fujitsu-based pcm business. The resulting company, Comparex, opened for business in Mannheim on Jan. 1. While Comparex includes BASF's pcm business, other peripherals, including disk and tape subsystems and magnetic media, remain a BASF concern. Held equally by the two West German partners, Comparex was initially capitalized at DM80 million ($36.9 million). Total turnover for the first year of operation, 1987, is targeted to top the DM1 billion level ($460.8 million), more than half of which will be generated outside West Germany.

Counting existing users, Comparex estimates it has around 3,000 customers in 10 European countries. The installed base of BASF and Siemens equipment runs to 650 processors and 30,000 peripherals. The joint venture company has a work force in excess of 1,000 people, over 50% of whom are involved in service and support.

While still under the BASF label last year, the data technology division added new top-end Hitachi mainframes to its 7/90 line of IBM-compatible processors. The addition of the 7/90-8 takes the range up to 70MIPS. BASF has sold Hitachi's mainframes for 16 years. Those sales amounted to DM600 million ($276.5 million) last year. Following a 1985 marketing agreement, the company continues to supply Nixdorf with Hitachi-built mainframes in the 1.3MIPS to 2.8MIPS range. Nixdorf sells the systems as the top end of its 8890 series. BASF also supplies South African company Persetel with machines.

Capital expenditures rose throughout the BASF group last year, while R&D spending in the dp divisions was up 31% to DM320 million ($147.5 million).

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COMPUTERVISION CORP.

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In 1986, Computervision began a financial turnaround: after six consecutive money-losing quarters, the company entered the black in the third quarter and posted even stronger results in the fourth. The number three company in the CAD/CAM/CAE industry—after IBM and Intergraph—Computervision still ended 1986 with a loss of $5.8 million. But the year's results represented a major improvement over 1985's loss of $80.8 million.

The improved profit picture at Computervision was achieved partly through strict cost containment, including a significant reduction in its work force in 1985. Revenues rose 12% in 1986, to $494.7 million from 1985's $441.1 million. Despite the rise, last year's results fell below the high-water mark of 1984, when Computervision made a profit of $41.4 million on revenues of $556.3 million.

Computervision's 18-month downturn reflected difficulties in revising its product line, from one based on proprietary devices to one based on industry-standard hardware. Today, Computervision's three major products groups—the Computervision Automated Design and Drafting System family of software and workstations (including the mainstay CDC 4000 and the newer CADDStation systems), the Medusa series, and the Personal Designer series—include systems based on proprietary hardware as well as hardware from Digital Equipment Corp., Prime, Sun Microsystems, and IBM.

In the fourth quarter, CADDStation—introduced in April 1986—accounted for 38% of product revenues and 46% of orders; by year-end, it had surpassed the CDS 4000 as Computervision's best-selling product line. Moreover, about a quarter of the orders for the new line are from new customers.

Some potential customers, according to one Wall Street firm, have complained about the CADDStation's $50,000 cost per station in networked configurations, about $10,000 higher than competitors' prices per station. The CADDStation line seems to be an important profit maker nonetheless. Results for 1986 were also helped by stronger than anticipated foreign sales.

62

MANNESMANN AG

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The sharply lower value of the dollar—down more than 25% against the deutschmark last year—depressed the Mannesmann group's dp results for 1986. Sales of computer products at Mannesmann Kienzle, the group's dp systems subsidiary, were essentially flat at DM1.06 billion ($489 million).

In West Germany, Mannesmann Kienzle performed well in the banking and government office sectors, where sales shot up by 40% and 29%, respectively.

The concentration on vertical market sectors intensified through 1986 as the company restructured to give its foreign subsidiaries a higher profile in their local markets. Replacing its previous method of imposing vertical marketing strategies from headquarters in West Germany, Mannesmann Kienzle set up specialist Competence Centres early this year. These centers will focus on the company's niche markets, namely manufacturing, financial, public administration, distribution, and printing. But they will also pursue a policy of developing products and strategies for markets in particular countries. In the U.K., for example, Mannesmann Kienzle's subsidiary is targeting the manufacturing, printing, transportation, and legal markets.

Currency fluctuations took a particularly heavy toll on Mannesmann Tally, the conglomerate's printer maker. It recorded unspecified losses despite increasing its printer sales in both the U.S. and the U.K. Mannesmann Tally describes its printer business as export intensive and therefore prey to the sharply lower value of the U.S. dollar.

Despite the setbacks, Mannesmann confirmed its commitment to the dp business with the acquisition of two dp-related firms. The parent company acquired 65% of Peripherie Computers Systeme GmbH (PCS), Munich, in May, adding the PCS Cadmus Unix-based CAD/CAM system to its product line. PCS reported sales of DM45 million ($20.7 million) for 1985. In October, Mannesmann Kienzle took full control of Alfa System Partner GmbH, West Germany, which specializes in printing and typesetting and has annual sales of DM20 million ($9.2 million).

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RACAL ELECTRONICS PLC

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Racal Electronics bounced back during 1986, with record dp revenues up a healthy 7% to £319 million ($469 million). It was an antidote to a gloomy 1985, when dp sales dropped almost 18%. Racal is now creeping back to the revenue level it reached in 1984.

Stronger demand in the data communications sector during the second half of the year was a big help. The British market is still by far Racal's strongest, providing 39% of revenues. Elsewhere, the company's Australian and Asian sales brought in 17%, Europe contributed 14%, and Africa 5%. In the past, Stateside operations, once known as Racal-Vadic and Racal-Milgo, had contributed as much as 40% of Racal's total revenues. Last year, Racal Corp., based in Boca Raton, Fla., kicked in only 25%.

A continuing success story for the company in 1986 was the Planet local area network system, a flagship product for many years. This token ring product is now installed at approximately 500 sites worldwide and is the European market leader. The company ascribed much of that success to the system's ability to support networked pcs and multipoint networks.

Racal introduced new products during the year aimed at expanding its corporate networking capability. These include the Racalnet programmable network processor, which can be used as a network node and offers between six and 1,000 ports. Also launched was the Omnimux 2000, a switching multiplexor-based system that can be used as a data PBX.

Racal also worked with the Scicon software and services subsidiary of British Petroleum to offer facilities management for large networks. The two firms will jointly bid on a major contract to set up the Government Data Network, which will link the U.K.'s top ministries.

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HARRIS CORP.

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Harris's corporate revenues for calendar 1986, $2.09 billion, represent a 9.4% decline from 1985. Its worldwide dp revenue also fell, although the 3.3% drop—to $464 million from $480 million—was not nearly as precipitous. (That figure does not include the Lanier Image Processing Division, which on Jan. 1, 1986, became a nonconsolidated joint venture, Harris/3M Document Products.) Still, net income, the number that matters, rose a tidy 13% to $68.6 million from $60.7 million.

Part of that success is attributable to the fact that the company got leaner and meaner. The number of employees decreased 15%, to 26,700 from 31,400, as part of a reorganization and consolidation that purportedly allowed the company to increase market focus and improve operating results.

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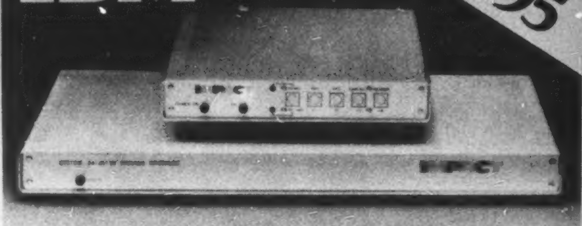

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"Because of the general softness of the markets in which we participate, Harris's Information Systems sales declined slightly in 1986," says Stephen Coleman, vp of marketing for the Information Systems Sector. "However, we experienced an upturn in orders in the latter half of 1986 as a result of a focused marketing program and our new product introductions."

Among other changes, the Information Systems Sector was broken into two sectors, the Lanier Business Products Sector (formerly the Business Informations Systems Sector) and the Information Systems Sector.

Information Systems led the charge against Digital Equipment Corp., which Harris considers its main competition. The company's Computer Systems Division introduced the MCX series of 32-bit supermicros in May '86. The MCX-3 and MCX-5, built around the Motorola 68020 microprocessor, extend Harris's CS series of Unix-based computers and complement the HCX-7, which the company introduced last year. The MCX line is composed of the single-processor MCX-3 Model 40, the single- or dual-processor MCX-3 Model 60 and MCX-5 Model 60, and the two- to four-cpu MCX-5 Model 70.

65

ATLANTIC COMPUTERS PLC

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Atlantic Computers scored an immense 75% rise in revenues to £320 million ($471 million). The company's profits are also up, rising 23% to £20.3 million ($29.9 million).

The growth is partially attributed to a company restructuring, which split the operating companies into four groups: computer services, DEC systems, manufacturing, and financial services. The key reorganization was in Atlantic's IBM computer leasing and distribution operations. These were merged into a new computer services group following the acquisition of the Netherlands-based ICA Group in December. ICA sells configured IBM and DEC systems and is expected to vastly improve Atlantic's standing in Europe.

Expanding its West German operation, Atlantic acquired BM Computer Systeme GmbH, a supplier of IBM equipment and services. In the U.S., Atlantic concluded its first full year of business. In the U.K., the Atlantic Computer Systems subsidiary set up a new ICL systems division. The subsidiary also made its first major installation in the Middle East and is reviewing the possibility of setting up an office in Hong Kong to target the Chinese market.

Among Atlantic's other groups, the DEC business was ahead of schedule: the Computer Systems Division, the DEC group's principal company, installed its first computer integrated manufacturing system and started a secondhand equipment business, brokering reconfigured DEC equipment.

Within the manufacturing group, Atlantic invested over £1.5 million ($2.2 million) to expand its data communication and networking product portfolio. The fourth group, Financial Services, encompasses Atlantic Medical as well as the company's financial services business. It will be augmented by a general capital asset financing unit, Atlantic Leasing, this year.

66

CAP GEMINI SOGETI

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Cap Gemini Sogeti consolidated its position as Europe's largest software and services company in 1986. Revenues rose 32% in local currency to FF2.9 billion ($419.9 million), while earnings jumped 50%, to FF190 million ($27.4 million). About one third of that revenue growth came from acquisitions.

By far the most important development in 1986 was the absorption of the U.S. firm CGA Inc., which was merged with Cap Gemini DASD to form Cap Gemini America. The group considers its U.S. operation to have reached the critical mass necessary to operate profitably in the American market. The acquisition more than doubled U.S. revenues to $120 million, and earnings were also more than doubled.

The company's other acquisitions in 1986 were on a smaller scale, although significant in the markets concerned. Cap Gemini doubled the size of its West German operation with the takeover of IBAT, a firm specializing in industrial automation. It also broke into the Italian market through the purchase of GE-DA, a developer of systems for large corporations and governmental administrations.

Cap Gemini continued to do well in its traditional markets, picking up a steady stream of contracts for videotex services, integrated information systems, and software engineering. Geographically, the company has achieved the three-way balance it has sought: in 1986, 28% of revenues came from the U.S., 37% from France, and 35% from the rest of Europe.

Cap Gemini is financially strong, having built up a war chest of FF1 billion ($144.3 million) with share and bond issues in 1986. The group was capitalized at FF7.5 billion ($1.1 billion) at the end of 1986, 50% more than a year earlier, and by mid-March 1987 had climbed to a value of FF10 billion ($1.6 billion).

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XIDEX CORP.

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A two-year spurt of acquisitions brought Xidex Corp.'s revenues to $533 million in 1986, three times what they were in 1984. As with so many companies in the computer storage business, however, Xidex reported disappointing earnings toward the end of the year but promised a better 1987.

Xidex was formed in 1969 and until 1985 was involved in computer microfilm and floppy disks. Its sales in 1984 were $178 million. Acquisitions since then have placed the company in markets for rigid disks, computer tape and cartridges, antiglare computer screens, disk drive diagnostic tools, and software duplication. Its revenues were up 56% last year and its earnings rose a healthy 27%, mostly due to the $23 million the company made in the fourth quarter by selling 1.7 million shares of stock it held in Seagate Technology Corp., another storage company. (In the same quarter, Xidex wrote off $16.4 million in unused real estate and obsolete equipment.)

After the acquisitions binge, the company concentrated in 1986 on integrating its new operations. It formed a data products division to include the floppy disk drive line and such related products as computer tape and cartridges and 14-inch rigid disks. Then it combined the small rigid disk businesses of Dysan Corp., Charlton, TriMedia, and Oktel into the data disk division. The company noted that the small disk market grew last year at a 50% rate. It is the fastest-growing segment of the disk market.

Xidex's micrographics business now accounts for less than 25% of sales, but the company noted that last year it supplied 70% of the world demand for duplicate microfilm. Export sales accounted for 27% of Xidex's 1986 revenues.

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SAMSUNG ELECTRONICS CO. LTD.

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Choong-gu, Seoul, South Korea
(82-2) 751-6114

Samsung is the top electronics company in South Korea, registering W348.3 billion ($396 million) in dp sales alone. Profit margins were highest on overseas oem orders for monitors, workstations, and pcs. The company clinched some spectacular oem orders last year, beginning with IBM, which ordered 1 million display monitors from Samsung last May. Near the end of 1986, NCR and Vendex, the Michigan-based auto parts group, closed deals with Samsung to supply AT-compatible products in 1987.

Costly end-user support continues to cut into the profits of domestic computer sales. Sales for two products did not take off in 1986, the SSM-32 and the UNIX-32, which attracted mostly inhouse customers and government institutions. Samsung, like GoldStar and other Korean dp hardware vendors, is hurting because of its own inability to offer an open-ended growth path in dp hardware and customers' lack of confidence in locally designed products. Samsung continues to build NEC's N5200 micros, and assembles and sells NEC ACOS mainframes.

Samsung/Hewlett-Packard, 55% owned by HP, claims that sales grew by 40% in 1986. Systems and instrumentation each accounted for half of the sales of the three-year-old joint venture. Major new product introductions included the Spectrum series—upgraded versions of the HP 3000 and HP 9000—and the 16-bit Vectra, South Korea's first dual-processor pc that offers true compatibility in English and Korean without the need to reboot.

The central office exchange business is a profitable one. Samsung has been building the M10CN high-capacity switch for seven years under license from ITT but the product's future in South Korea is in doubt and so is Samsung's relationship with ITT.

In the PBX market, Samsung installed about 12,000 lines of the Rolm CBX-II last year, but profit margins were shaved by competitors such as Daewoo Telecom, which makes Northern Telecom's SL-1, and GoldStar Telecommunication, which makes the NEC NEAX-2400.

Samsung has opened negotiations with IBM with the goal of forming a joint venture company specializing in systems integration—a counterpart to Systems Technology Management, the GoldStar-EDS joint venture—and entering the value-added network business once the government relinquishes its monopoly over the data telecommunications business.

69

APOLLO COMPUTER INC.

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Chelmsford, MA 01824
(617) 256-6600

Apollo reversed a late 1985 revenue slide with a move into the low-cost workstation segment dominated by Sun Microsystems Inc. The $10,000 Domain 3000 workstation helped Apollo capture customers in Sun's traditional software engineering and electronic publishing markets.

Aided by strong European demand, acceptance of the Domain 3000 returned the company to double-digit growth rates. Overall, international sales continued their sharp climb, accounting for 48% of total revenues, up from 31% in 1985 and 18% in 1984.

For the year, revenues rose 32.5% to $391.7 million, up from $295.5 million in 1985. This helped Apollo close the year with a profit of $9.3 million compared with a loss of $1.5 million in 1985. Its stock price similarly rebounded from a low of 9¼ early in the year to 18¼ at the close.

Domain 3000 deliveries have led executive vice president Roland D. Pampel to predict Apollo's total shipments would exceed 20,000 this year.

The move into the low-end market emboldened Apollo to look at another segment of its business, engineering networks. Digital Equipment Corp. had already staked its claim to the engineering workstation market with a homogenous network approach, selling its VAXstation workstations as adjuncts to VAX host computers. Seeking an advantage over DEC through third-party alliances, Apollo recast its Domain LAN as a heterogenous systems LAN and began lining up support among specialized processor makers.

Apollo promised to release specifications of its Domain protocols and give its Domain network users transparent access to VAX RMS, Sun's Network File Systems, and OSI/FTAM file systems. The approach allowed Apollo to broaden its existing agreements with such specialized computer vendors as 64-bit computer maker Alliant Computer Systems Corp., Lisp workstation supplier Texas Instruments Inc., and database machine vendor Britton Lee Inc.

70

AGS COMPUTERS INC.

1139 Spruce Dr.
Mountainside, NJ 07092
(201) 654-4321

Owing to aggressive acquisitions and big growth in its software and distribution businesses, AGS Computers Inc. has emerged as one of the largest companies in the software and services industry. In 1986, revenues jumped 37% to $381 million, while net income rose to $8.8 million from $7.5 million.

Founded in 1967, AGS now has two major lines of business: software products, both custom developed and packaged programs, and distribution of microcomputers and related peripheral equipment. The custom software products business grew a healthy 23% in 1986, primarily on the strength of business from brokerage firms and banks, says Lawrence J. Schoenberg, chairman and chief executive. But the packaged programs business inched up only 4% last year, largely because of what Schoenberg describes as a "poor year" for large computer productivity tools.

AGS entered the government market in 1986 through the acquisition of Genasys Corp., Rockville, Md., a project software developer and systems integrator in the federal government market. For $19.5 million it bought Vista Concepts, New York, which provides software to banks for security processing and handling. It also acquired APR Inc., Columbus, Ohio, which provides custom programming for the communications industry; Systemtech Inc., a professional services company in Dallas; and branch offices from Compuware in San Diego and Houston. It paid a total of $6.7 million for Genasys, APR, Systemtech, and the Compuware offices.

On the downside, AGS experienced fallout from AT&T's retrenchment in the computer industry. AT&T and affiliates represent AGS's largest account. Revenues dropped to $25 million in 1986 from $29 million in 1985.

71

SHARED MEDICAL SYSTEMS CORP.

51 Valley Stream Pkwy.
Malvern, PA 19355
(215) 296-6300

Serving a health care industry beset by financial and competitive pressures has kept Shared Medical Systems revenues in a climb that they've maintained for five years.

While 1986 revenues of $374.9 million were 20% above the 1985 total of $312.2 million, earnings didn't fare as well. They fell by 23% to $32 million from $41.7 million, adversely affected by shutdown expenses of a Japanese subsidiary. These caused a second-quarter loss of $10.6 million.

Reimbursement policies favoring outpatient care, more stringent insurance eligibility standards for inpatient care, and technology advances expanding the scope of outpatient services resulted in a dramatic increase of activity in those areas during 1986. SMS, which derives the majority of its revenues from systems and services provided to acute care hospitals, enhanced its outpatient offerings for both physicians and administrators.

The company expanded its IBM PC workstation offerings to include a Medical Record Workstation that supplies traditional workstation capabilities and adds such functions as medical record abstracting and coding. Under development is an application device that will enable hospital personnel to collect and review patient data wherever the patient is located.

SMS last year continued development of a growing line of consulting services for physicians to whom it offers professional advice on a variety of financial matters. This comes under its Practice Management and Consulting Services operation for which it opened new offices in the South and Midwest during the past year.

Though it has bowed out of Japan, SMS has ongoing operations in the Netherlands, Canada, the United Kingdom, Ireland, West Germany, and Spain.

72

FERRANTI PLC

Bridge House, Park Rd., Gatley
Cheadle, Cheshire SK8 4HZ, England
(44-61) 428-3644

Business picked up last year for Ferranti's Computer Systems Division. Even so, it is still an unsettled operation: early this year, rumors spread that 500 staffers would be laid off in 1987. The reasons cited were that the company's core business in defense systems had suffered because of a slowdown in overseas orders and cuts in U.K. defense spending. Still, sales in the civilian sector clearly propped up falling defense revenues.

A few large orders, such as a £5 million ($7.4 million) deal with the Royal Navy for 17 of Ferranti's Argus minicomputers, and the hard-won status of preferred supplier of pcs to British Rail, helped push Ferranti's worldwide dp revenues up by 16% to £239 million ($351.5 million) during 1986.

Ferranti Computer Systems is split between three major U.K. sites: Wythenshawe, which specializes in automated process control equipment, management systems, communications, and office systems; Bracknell, which concentrates on defense contracts; and Cheadle Heath, which is involved in both civil and defense deals, and which develops sonar and monitoring systems. Each is reported to have performed well, although the Bracknell site took the brunt of the defense spending cutbacks.

Among the company's overseas dp interests is Ferranti International Controls Corp. in Houston, which works with Wythenshawe to develop control systems for the electricity supply industry. Other dp-related subsidiaries operate in West Germany, Benelux, Australia, and Brazil. Much is expected of the U.S. operations, which managed to rack up over $100 million in revenues in 1986.

Last year's new products from these Ferranti companies included AT and XT extensions to Ferranti's line of IBM-compatible pcs. These higher-performance machines fit the Ferranti product philosophy of offering pcs as part of larger systems deals rather than marketing the machines as standalone units. With the recent IBM attack on this sector of the micro market, though, the company is now reassessing its pc development strategy.

73

DATAPRODUCTS CORP.

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Woodland Hills, CA 9136
(818) 887-8000

Dataproducts Corp. put away the red ink in 1986 despite revenues that were down more than 5% to $350.8 million from $370.6 million. It was clear proof that belt-tightening can pay off, and the company continues to bill itself as "the world's leading independent computer printer manufacturer."

Dataproducts went from a loss of $29.7 million in 1985 to earnings of $12.8 million last year, a heartening turnaround but still a far cry from the $35.8 million earned in 1984.

Appropriately, the company's annual report for fiscal year 1986, which ended March 9, 1986, dwelt on "weathering the storm," and its cover was of that yellow stuff of which rain slickers are made. A two-page centerfold showed company management attired in such slickers, their images reflected in a puddle.

The self-proclaimed "leaner and more aggressive (not meaner)" Dataproducts changed top management in '86. Jack C. Davis was brought in from Harris Corp. to be chairman and chief executive officer. At Harris, he had been a senior vice president. Later, following the retirement of Graham Tyson, cofounder and president of 25-year-old Dataproducts, Davis also assumed the presidency.

Trimming down included closing three manufacturing plants and laying off more than 25% of the work force, reducing the number of employees to 4,200 worldwide. It wasn't all cutting back, though. Last November, the company formed a wholly owned Canadian subsidiary called Dataproducts Canada Inc., Richmond Hill, Ont.

Dataproducts has begun a move to concentrate on the high end of the printer market, particularly nonimpact printers and page printers utilizing laser technology. The company continues to produce thermal and solid ink nonimpact printers as well as band, daisywheel, and serial dot matrix printers in the impact class. Performance characteristics range from speeds of 20 to 400 characters per second for serial dot matrix printers to speeds of 300 to 2,000 lines per minute for line printers, and speeds of 12 to 26 pages per minute for page printers.

74

TEKTRONIX INC.

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Beaverton, OR 97077
(503) 627-7111

Tektronix's fiscal year ended on a dreary note in May 1986: earnings plunged 56% on a 9% drop in sales. With little sign of a turnaround, the company took what it called a painful step, laying off 2,000 employees, bringing the total work force to around 17,000 from an all-time high of 24,000 in 1981. Another program was aimed at reducing manufacturing costs as a ratio of sales to 45% from 55%; it accomplished this late last year.

The cost-cutting worked: three consecutive quarters saw an increase in earnings, for a nine-month rise of 37% over last year's comparable period.

Design automation and information display activity accounts for nearly all of the company's data processing revenues, which totaled $350 million in 1986, a decline of about 5% from 1985. Total corporate sales in calendar year 1986 were $1.3 billion, off 6% from the year before. Earnings, at $55 million, declined 21%.

Hottest of the 12 products in the dp category are graphic computer terminals, computer aided engineering systems, and artificial intelligence systems.

To speed its entry into computer aided engineering markets, Tektronix acquired CAE Systems two years ago, but failed to realize any growth last year because of extensive debugging and an overall slowdown in the market. Tektronix, which has been selling micro development products since 1978 through its Software Development Products Division, says it is launching a major drive to develop productivity tools for software engineering. It renamed the division the CASE division (for Computer Aided Software Engineering) and last summer announced a series of structured analysis tools, design tools, and a 32-bit microprocessor development system for Motorola's 68020 and Intel's 80286 chips.

In answer to an edict from management, each of Tektronix's 20 divisions plans to turn out one major new product a year, and, over the next three years, product development cycles are to be cut in half. As a result, the company's R&D budget has begun to climb, rising to 14.5% of sales last year from about 11% in 1984.

75

NORSK DATA AS

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Oslo 6, Norway
(47-2) 626000

Despite a slowdown in its home market, Norsk Data AS increased worldwide revenues by 36% in local currency to NOK2.58 billion ($349.1 million). Net income for the year rose 28% to NOK468 million ($63.3 million).

In Norway, the company has become known as "the millionaires' factory" because each employee is offered annual options to buy shares and, with sales increasing at a compound rate of 45% over the last decade, it has managed to create more millionaires than any other company in Europe.

Norsk Data continues to derive the bulk of its revenues from Scandinavia, where sales in Norway, Sweden, and Denmark account for 70% of the total. Last year, Norsk initiated a push to increase its presence elsewhere in Europe. Its target markets on the way to achieving a Continental business goal of over 30% of revenues are West Germany, the U.K., and France, where the company has a tie-up with Matra Datasystems. This business accounted for around 22% of last year's total.

Enhancements to Norsk's minicomputer line in 1986 included additions to the ND-500 line of 32-bit superminis. Central to this was a front-end processor to handle the increased number of terminals supported by the new extended version of Norsk's Sintran operating system. In 1987, Norsk has added processors built around 32-bit CMOS microprocessors with a performance range of from 1MIPS to 8MIPS.

76

SUN MICROSYSTEMS INC.

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Laying the groundwork for a move out of its workstation niche was at the forefront of Sun Microsystems' plans in 1986. Heretofore a supplier of low-cost engineering workstations, the company prepared itself to participate in a broader set of markets. First, it sought the financial backing by way of two public stock offerings, and then it attempted to shake off its low-end image with a move to higher-performance and multiuser systems through its Sun-3/200 Series computers.

The continuing industry downturn notwithstanding, the pursuit of new markets was not a reflection of poor sales in its core markets: sales for the year more than doubled—propelling Sun onto the DATAMATION 100—and earnings were three times the levels of 1985.

Revenues for the year were $341.1 million, a dazzling increase from $147.1 million in 1985, while net income soared to $24.5 million. International revenues accounted for nearly a third of total sales. An initial public offering in March netted $45 million and led to a secondary offering that brought the total to $125 million.

Among its moves to capture a broader customer base, Sun released an IBM PC-compatible coprocessor enabling its workstation users to run PC/DOS applications. The company also moved to broaden its applications library with the release of SunOS, an operating system revision incorporating Unix System V and Berkeley 4.2. At year's end, the company boasted some 900 available applications.

Sun's software thrust paralleled the expanded connectivity linking its workstations to minicomputers. Sun's Network File System, a distributed file sharing scheme, was adopted by Data General, Hewlett-Packard, and Digital Equipment Corp., among others, for their Unix-based computers. The Network File System enables such systems to share data transparently with Sun workstations.

77

BRITISH TELECOM PLC

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British Telecom, enjoying the freedom and funds that came with its privatization in 1984, went on a shopping spree last year, looking for companies to bolster its international standing.

Early in 1986, BT concluded its purchase of a 51% stake in Canada's Mitel, but was prevented by the Canadian government from taking over the Canadian telephone network company, Teleglobe. BT then moved on to the U.S., where it bought ITT Dialcom and its electronic mail services, which have 100,000 subscribers worldwide. Closer to home, BT scooped up the core businesses within STC's IAL cellular radio and satellite subsidiary, giving BT a firmer foothold in a number of international markets dominated by Cable & Wireless.

Several alliances also added to BT's dp product lines: it signed with Zenith Data Systems to resell Zenith's pcs through the BT Merlin office systems subsidiary, began manufacturing Unix systems under license from the U.K.'s Bleasdale Computers, and it also signed a $5 million oem deal with Stratus. It joined 13 other companies in committing to the X.400 messaging standard and heralded the growing importance of integrated voice and data networks with the founding of its Communications Facilities Management Service.

Dp revenues, including Dialcom's and Mitel's digital PBXs, were £224.7 million ($330.4 million) out of total revenues of £9.5 billion ($14 billion).

BT will find it harder to please its shareholders in 1987, facing a challenge for large customers from newly formed Mercury Communications. But to keep profits rising, BT says it will cut 24,000 jobs over the next four years. These cuts, and the BT privatization itself, have obviously found no favor with U.K. labor unions. BT ended the year in protracted talks over pay and working conditions, and strike threats seemed likely to turn into strike realities.

At year's end, Mitel had some cheerful news: its first profitable quarter in nearly two years. While revenues rose 38% in U.S. dollars, to $406.3 million, Mitel still finished $140 million in the red, mostly a result of big write-offs last summer.

78

DIEBOLD INC.

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(216) 489-4000

In 1986, Diebold did what all companies selling computer-based ATMs and security equipment to banks were doing: it drastically cut back on costs. Result: a profit of $34.9 million, 15% over last year when Diebold earnings had dropped 47% and sales declined 13%. Sales of $414 million were a mild increase of $2.7 million over 1985.

What it didn't cut was R&D: over the last two years, Diebold has invested nearly $33 million. The market leader in sales of automated teller machines, Die-

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CIRCLE 64 ON READER CARD

bold last year announced 26 new products—one of them expected to answer the two-year-old decline in sales to banks. The new product is a much smaller ATM than is standard, priced in the $10,000-to-$15,000 range, about half the usual ATM price.

High price (annual maintenance alone can run $12,000 on an ATM) and market saturation both contributed to the sales decline, Diebold believes. In all, some 60,000 ATMs are now installed in the U.S., and predictions that 150,000 or 200,000 machines would be in use by 1990 have now been scaled back to well under 100,000.

With its new product, Diebold thinks the momentum will resume, as smaller banks discover that the lower price and limited function of dispensing money will appeal to customers. Diebold envisions the new ATM, which it calls the "everywhere teller machine," in rural areas and in retail stores.

Diebold introduced an interactive video system through which consumers can obtain information on events and tickets, and this August it will begin delivering 2,000 videocassette vending machines to Group 1 Entertainment, Los Angeles, under a $36 million contract signed last October.

Diebold, along with the rest of the ATM industry, is heading in two directions: toward more sophisticated equipment with more capabilities, and toward simpler and cheaper machines requiring less maintenance.

79

DATAPOINT CORP.

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San Antonio, TX 78284
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Datapoint Corp. has cut its losses but continues to operate under a black cloud. The beleaguered company lost $1.8 million in 1986 on revenues of $325 million. In 1985, losses totaled $62.1 million on revenues of $404.2 million. The lesser loss was attributable to cost-cutting, particularly in employment expense.

Just after the close of '86, Edward P. Gistaro, president and chief executive officer, who earlier in '86 had talked of "a significantly different and improved company . . . beginning to see positive results," resigned for "personal reasons." His successor, Doris D. Bencsik, who had been executive vice president and chief operating officer, has continued to fight the battle against red ink since that time and has had the unenviable task of firing 786 employees.

Of course, Asher B. Edelman, the New York investor who owns 8% of the company and who once proposed to take the company private through a leveraged buy-out, is still very much in the picture as chairman. Currently, he is the target of a shareholder suit.

Datapoint, which 10 years ago pioneered the concept of local area networks, announced enhancements to its Starfleet family of office automation products, including an 80286-based applications processor, an AT-compatible file server, a desktop laser printer, an advanced SNA communications facility, and new high-speed modems. Datapoint also announced enhancements to its ARC (Attached Resource Computer) local area network, which were designed to reflect a new marketing thrust by targeting departmental or corporate systems requiring integration of dissimilar equipment.

The highlight of the announced enhancements was Starship II, a multiprocessor system supporting from 40 to 120 users. The company also rewrote its RMS (Resource Management System) operating system using a high-level systems development language to support the 80286 multiprocessor technology. These October announcements, says vice president of product development Larry D. Wickwar, add up to a solution that competes in power and capacity with such standalone systems as Digital Equipment Corp.'s VAX 8200s and 8300s, while providing the benefits of ARC local area networking.

80

CONTEL CORP.

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When Contel—previously known as Continental Telecom—closed its books on Dec. 31, 1986, revenues were up 17.2% to $3.07 billion, thanks in part to some major acquisitions it made in '85. Consolidated net income rose 2.6% to $232.9 million from $226.9 million. If one follows the company's line and excludes one-time 1985 charges and gains, and the loss of the Investment Tax Credit—wiped out by the Tax Reform Act of 1986—overall earnings increased 20%. DATAMATION estimates that dp revenues rose 12% to $311 million.

No wonder Washington, D.C.-based Comsat (Communications Satellite Corp.) wants to buy Contel. A proposed $2.5 billion merger, approved in September by shareholders of both companies, would make Contel a wholly owned subsidiary of Comsat, which is one fifth of Contel's size. The deal calls for the issuance of 71.4 million new Comsat shares and a $2.5 billion stock swap. Contel executives would manage the new $6.6 billion company. The Comsat name would be retained, but that would be about the only reminder of the company created in 1962 to represent the U.S. in Intelsat, the international satellite consortium.

But none of this may come to pass; in March '87, when the Federal Communications Commission ordered Comsat to refund about $62 million of what the agency contended were excess profits, Contel decided to take a hike. That didn't exactly make Comsat's day, since it had lost $41.5 million in 1985, so it refused to accept the cancellation, saying it would do everything it could to see that the deal went down as scheduled. On April 30, there was further fallout when Contel president and ceo John Lemasters resigned over "differences in both management philosophy and operating policy." Contel denies that his departure was directly linked to the cancellation attempt, but the smart money says otherwise.

81

BELL ATLANTIC CORP.

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Philadelphia, PA 19103
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Acquisitions in computer maintenance, leasing, and turnkey systems put Bell Atlantic Corp. solidly in the dp business. Bell Atlantic owns Sorbus, one of the top third-party computer maintenance firms. Founded in 1971 as part of Management Assistance Inc., Sorbus claims to service more IBM equipment than anyone else, relying on 1,600 field engineers to maintain everything from printed circuit boards to mainframes.

Sorbus accounts for the bulk of Bell Atlantic's dp revenues, which DATAMATION estimates at $310 million in 1986. Computer leasing revenues will swell that figure substantially in 1987. In October, Bell Atlantic acquired Greyhound Capital Corp. of Phoenix. With annual revenues in the $200 million range and an employee count of about

350, the acquisition makes Bell Atlantic one of the top five players in the U.S. computer leasing market.

In 1986, Bell Atlantic also made two acquisitions in the Digital Equipment Corp. world. In December, the company acquired Technology Concepts Inc. of Sudbury, Mass., a communications and custom software company that offers CommUnity, a networking software product designed to permit a wide range of computers to work with DEC systems on a DECnet network. Also in December, Bell Atlantic acquired Electronic Service Specialists Ltd. of Menomonee Falls, Wis., which provides parts service for DEC systems.

Bell Atlantic has a stake in turnkey systems through MAI Canada, which supplies systems based on Basic Four computers for the automobile dealer, health care, and municipal government markets.

Taken together, the nontelephone businesses are the fastest-growing part of Bell Atlantic, one of the regional Bell operating companies created by the 1984 divestiture of AT&T. In 1986, revenues from Bell Atlantic's nonregulated side were up 41% to $601.1 million. Total revenues were $9.92 billion, a 9% increase over 1985. Net income was up 7% to $1.2 billion.

82

CSK CORP.

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Japan's largest independent software house is trying to participate in what it hopes will be the transformation of the country's software industry. Traditionally, Japanese large computer users have had an aversion to software packages, insisting instead on custom software. CSK grew into the leader in its field by catering to these preferences: instead of creating its own products, CSK has been the premier supplier of talented software engineers to companies intent on creating their own systems and applications.

This approach has its disadvantages: among them, poor morale and the loss of employees to the customers they work with. So, in recent years, CSK has moved to attain more control over its projects. One goal has been to work by contract for each project rather than billing for employee time.

The company now believes, however, that the market in Japan is ready for a major transformation. Users are beginning to find out that standardized packages can be the better way. So CSK has set up new divisions and subsidiaries to develop and sell software packages. Among the operations is Computer Software Organization (CSO), a joint venture with value-added reseller Miroku & Co. CSK expects the package software market to grow by 42% for each of the next few years. It's especially well positioned to cash in on the coming AI boom, having signed up in 1984 as distributor for IntelliCorp's KEE products. In 1986, CSK posted revenues of just over ¥52 billion ($308.7 million), an increase of 15% over 1985.

Besides software development, CSK offers data entry and facility management services. It gets 11% of its revenues from leasing, a market that has tightened with the entry of several new companies. Computer sales are also substantial, contributing nearly a quarter of revenues and holding steady in 1986.

83

CONVERGENT TECHNOLOGIES INC.

2700 N. First St.
San Jose, CA 95150-6685
(408) 434-2848

Convergent Technologies Inc. was knocked flat by shrinking contracts in 1986; the biggest blow was delivered by AT&T, which was having little luck selling the Convergent-built Unix pc: 1986 revenues of $80.5 million from AT&T were down almost 50%.

That, and declining shipments to the rest of the company's customer list, which includes Unisys, NCR, Bull Transac, and ADP, led to a loss for the year of $32.8 million, or 73 cents a share. In 1985, Convergent posted $13.2 million—or 30 cents per share—in earnings. Total revenues slipped to their lowest in three years, down by nearly 33% from 1985 to $305.8 million. This dismal financial picture forced Convergent to reduce its work force by 10% to 2,483 at the year's end.

The bad news from AT&T confirmed Convergent chairman Paul Ely in his plan to move the company away from dependency on fickle oem customers. Convergent officially broke itself into two divisions: Convergent Technologies, which continues the traditional microcomputer oem and var businesses; and Convergent Business Services, a "federation" of acquired companies that serves end-user vertical markets. Ely has said he expects Convergent Business Services to account for $300 million in sales within three years.

Although jilted at the merger altar by 3Com Corp. in March, Convergent has found plenty of other willing partners, acquiring Display Data Corp. (DDC), Hunt Valley, Md., which markets a turnkey system to auto and truck dealerships, beverage distributors, and lumberyards; Digital Systems, a Pensacola, Fla., reseller of Digital Equipment Corp. systems to accountants and contractors; and Open Systems Inc., Minneapolis, which supplies accounting systems to small businesses.

84

BOEING COMPANY

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Seattle, WA 98108
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Boeing overall had a good year in 1986. Its sales were up almost 20% to $16.34 billion from $13.64 billion, while its earnings rose 17%, to $665 million from $566 million.

Boeing Computer Services (BCS) had revenues of $1.19 billion in 1986, but most of that was from services provided internally to Boeing users. Sales to commercial users brought in $300 million, an increase of 20% over 1985.

Some of BCS's 1986 activities were based on partnerships: it announced with AT&T a joint arrangement to compete for a 10-year, $4.5 billion government contract to provide an ISDN network. A decision on this bid is expected late this year. In September, BCS formed a strategic alliance with Scientific Computer Systems Corp., San Diego, to provide operating system software for Scientific Computer's SCS-40 near-supercomputer. As a subcontractor, BCS increased its role in providing data processing, telecommunications, and information services support to Westinghouse at the Department of Energy's nuclear power facilities at Hanford, Wash.

BCS continued to provide services for the National Aeronautics and Space Administration, under a contract begun in 1985. The company also continues its sponsorship of the Technical and Office Protocol, which works hand in hand with General Motors' MAP.

An Electronics High Technology Center was established in the Seattle area by Boeing Electronics Co. to conduct advanced research aimed at technologies needed for products that are five to 15 years in the future. An ongoing emphasis on artificial intelligence led to the formation of AI laboratories in most of the company's operating organizations.

85

PLESSEY CO. PLC

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Plessey began 1986 with the threat of a takeover by U.K. electronics giant GEC still in the air and business far from booming. Its computer peripherals business continued to be a drain on resources, and telecommunications equipment orders were only marginally higher than in 1985. Plessey finished the year with income of £115 million ($170 million) on sales of £1.5 billion ($2.17 billion). DATAMATION estimates that sales of computer peripherals and datacom equipment came to £200 million ($294 million).

Much of the year's energy was spent deflecting GEC's hostile bid for the company. While the U.K. Monopolies and Mergers Commission (MMC) considered GEC's bid, Plessey considered a poison pill defense. After a long, and mostly cold, British summer, the Department of Trade and Industry (DTI) rejected GEC's bid on the grounds that any merger of the U.K.'s two largest defense contractors would be contrary to the interests of national security.

Plessey could then breathe a sigh of relief, although the DTI decision did include a recommendation that the two vendors consolidate their System X digital central office switch businesses. Neither wanted to give up management control, however, and the venture in public switching never materialized.

In the U.S., Plessey's Stromberg-Carlson subsidiary scored its first success with one of the regional Bell operating companies. In February, it landed a trial contract from BellSouth Corp.'s South Central Bell unit for a central office digital exchange. It followed up with a similar contract with Pacific Telesis. Plessey feels it needs still more long-term international business. The shake-up that started last year in the European telecommunications equipment market is not over, and Plessey must join one of the emerging consortia if it is to secure its future.

86

GOULD INC.

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Ask most people what it is Gould sells, and they'll say they don't know. But a look at 1986 reveals the answer: Gould sells divisions. The company has been ejecting pieces of itself since the announcement in 1984 of a radical five-year plan to dedicate itself purely to electronics. An understandable result of this ejection plan has been a drop in revenues—to $908.8 million in 1986 from $1.4 billion in 1984—coupled with a decline in net corporate income, with a loss of $101.8 million last year. At least Gould didn't lose nearly as much as the $175.5 million it did in 1985. Gould's dp sales, which DATAMATION estimates were $290 million, were up 7.6% over 1985, but still below Gould's dp sales in the early '80s.

The bulk of Information Systems unit sales are in minicomputers, with the rest going to image processing systems and related software. But Gould considers its brand-new NPL family of minisupercomputers its "most important new computer system ever produced, with an advanced architecture that will serve as the foundation for new systems to be introduced throughout the 1990s." The NP1, the first model, features parallel and high-speed vector processing and runs Unix. Gould also introduced MicroSel, a distributed computer system for simulation, and a new image processing system called the IP 9000.

But it was easy to lose sight of these factors when large chunks of the company were falling from its flanks. Gone are its Medical Products Group, the Mexican battery business, and all of the company's defense systems business. Also, on the way out are the French battery business and all remaining real estate assets. Perhaps most significant was the sale of the Palm Beach Polo and Country Club, which came on the heels of James F. McDonald's replacing Gould's longtime chief William T. Ylvisaker as chairman. Ylvisaker was an avid polo player and some shareholders had complained that owning the club was inappropriate.

87

MAI BASIC FOUR INC.

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In 1986, MAI Basic Four kicked off a growth campaign, seeking to add vertical software to its product roster, acquire key distribution channels, and expand its European third-party service business. Financed through a $50 million debt offering in September, the effort resulted in the acquisition of a European applications developer and computer distributor.

Spun out in 1985 from Management Assistance Inc., MAI Basic Four profits rocketed 215% to $10.4 million on sales of $287.9 million, a 15% increase from the year before. The company's financial plan, according to financial vp Frederick D. Anderson Jr., aims at compound annual growth rates in revenues and profits of 15% and 20%, respectively.

To achieve these goals, MAI Basic Four charted an aggressive acquisitions course. Leading off was the approximately $1 million purchase of Adviesbureau voor Kwantitatieve Bedrijfsanalyse (AKB), an Antwerp-based distributor of Basic Four computers in Belgium, the Netherlands, and France.

A second stop on the expansion course saw the reorganization of MAI Basic Four's field service operations. The onetime captive and exclusively international business was expanded to include the servicing of other vendors' peripherals and computers in addition to MAI Basic Four equipment. Consolidated under the name TekServ, the field service operation produced 1986 revenues of $54 million and it aims to reach $100 million by 1990, says Anderson. Overall, international customers accounted for some 60% of business and 100% of service revenue.

In software, the company's portfolio expanded via a joint marketing venture with Arthur Young & Co. The agreement gave MAI Basic Four nationwide marketing rights to software for municipal governments.

The year also saw the release of an MAI Basic Four high-end family of 32-bit computers, the MPx 9000 series. Shipments of the minicomputer systems, able to support up to 164 users, began in April; by the year's end, they made up about $30 million of 1986's bookings.

88

SONY CORP.

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Shinagawa-ku, Tokyo 141, Japan
(81-3) 448-2111

Sony's dp sales were down an estimated 9% in 1986, and total revenues showed a 7% sales drop to ¥1.32 trillion ($7.86 billion) with profits off 38.3% to ¥41.9 billion ($248.6 million). With 68% of sales overseas—32.2% in the U.S. alone—the rising yen hurt. This condition particularly affected dp figures, a large proportion of which come from oem contracts for floppy disk drives with U.S. manufacturers such as Apple and Hewlett-Packard. The company has 30% of the world market for 3½-inch drives.

Although dp products represent only about 4% of sales, the company hopes to expand its role to even out the fluctuations caused by heavy dependence on consumer items. Recording and display technologies will get the most attention. Moving upscale in storage devices, the company in September presented its first hard disk drives, two 5¼-inch half-height models with a maximum formatted capacity of 40MB and SCSI interface. Optical storage was also covered with a new Motorola 68010-based write-once optical document filing system.

The color television technology that brought about high-resolution tvs has also resulted in oem sales of color monitors. In 1986, Sony's involvement with computer graphics leapt forward with the introduction of one of its most interesting dp products to date, a 68020-based Unix BSD 4.2 engineering workstation called NEWS, for Network Station. Three models, ranging in price from ¥950,000 to ¥2.8 million ($5,630 to $16,600) were available, and the company reported that its first six months' production run of 2,400 machines had been easily sold out. Other computers, such as the laptop SMC210, have done poorly.

89

LOTUS DEVELOPMENT CORP.

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Cambridge, MA 02142
(617) 577-8500

Despite a slew of new products and the acquisition of five new companies, Lotus is still best known for one product, 1-2-3: the two-millionth copy of the spreadsheet package was shipped last October. Lotus posted $283 million in worldwide revenues in '86, an increase of 25% over 1985's $225 million; however, revenue increases continue to level off: in 1984, revenues were up 196% over 1983, and 1985's growth was 44%.

Net income rose 26.4%, to $48.3 million. Non-U.S. revenue share jumped to 24% in 1986 from only 14% in 1985 as a result of eight foreign language versions of 1-2-3 and Symphony, introduced in '85, and the Japanese version of 1-2-3, which was introduced in early 1986.

Among the new products introduced in 1986, either through company acquisitions or in-house development, are T-A-C (The Application Connection), which allows micro users to access mainframe data; Lotus Metro, a business productivity program; Lotus Manuscript and Lotus Measure, the first two product offerings from the year-old Engineering and Scientific Products Division; Lotus Express, a product developed jointly with MCI that facilitates the transmission of spreadsheets, graphics, and documents via MCI Mail; and the long-awaited HAL, an add-on product for 1-2-3 that gives commands in English phrases and allows users to undo mistakes more easily. Lotus released its first CD-ROM product, Lotus One Source, a collection of financial databases updated daily. The Lotus Multi Value Plan (MVP) for customer service and support had a lukewarm reception. Lotus, conceding that MVP was "confusing," is redefining it.

Founder Mitch Kapor resigned his chairmanship in 1986; Jim P. Manzi, Lotus's president and ceo, added the title of chairman.

90

CONTINENTAL INFORMATION SYSTEMS CORP.

1 CIS Pkwy.
Syracuse, NY 13221-4785
(315) 437-1900

During 1986, uncertainty over tax reform didn't seem to hurt Continental Information Systems, which remarkets new and used computers as well as commercial aircraft and other big ticket items. In 1986, total revenues rose 26% to $283 million, with sales and leases of computers accounting for most of that.

Although the market for leases on new computers was soft during the year, CIS made up for it by remarketing used computers. This aspect of its business should grow in 1987, bolstered by the elimination of the Investment Tax Credit. Without it, companies have less to gain from investing in new rather than used equipment, but the real boon from tax reform for leasing companies was the imposition of the new Alternative Minimum Tax. It was designed to raise additional tax revenues by limiting the write-offs gained through accelerated depreciation of new equipment. But many companies have discovered they can still keep their taxes down by leasing instead of buying.

As tax reform giveth, it also taketh away. Sale of tax-sheltered investments to private individuals is no longer permissible. In its fiscal year that ended in February 1986, CIS relied on tax-sheltered investments to individuals for 8% of the capital it raised. Since then, CIS has sought out other funding sources, including $36 million from an offering of convertible debentures and another $15 million in a private placement with an insurance company.

CIS president and ceo Harry Goetzmann Jr. expects the new tax law to bring about a wave of consolidation among medium-sized computer leasing companies. CIS, however, is gearing up for big growth. The company expects to double its direct sales force to about 120 during 1987.

91

NOKIA CORP.

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(35-8) 05671

With local strikes hurting sales in the domestic market, Finland's largest publicly traded company worked hard to develop its export business last year. Sales for the entire Nokia Group rose 9%, to Fmk12 billion ($2.4 billion), with the contribution of Nokia Information Systems (NIS) rising to Fmk1.4 billion ($273 million).

Export sales accounted for 60% of the corporate total, with NIS performing particularly well in Scandinavia and West Germany. Net corporate income for the year rose 20% to Fmk674 million ($132.9 million), chiefly the result of profits within Nokia's electronics sector. Nokia's other major divisions (cable and machinery; paper, power, and chemicals; rubber and plastics) all suffered drops in operating profits.

The company moved away from its traditional forestry business toward increased emphasis on electronics. NIS sold its service bureau and made moves into new communications markets. It set up the Matra Nokia Radiomobiles cellular telephone venture in France and took a major contract in China. Nokia's Salora-Luxor oem division, which supplies vdts and videotex terminals, fared less well.

Nokia spent the equivalent of 17% of its data processing sales revenue on dp R&D last year, with part of the money coming from shares targeted at foreign investors.

92

UNITED LEASING PLC

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The British computer leasing company, United Leasing, squeezed onto the DATAMATION 100 in 1986 for the first time, with dp revenues of £182 million ($267.6 million). It will be the only time the company, as such, makes the list. Early this year, United was acquired by Inspectorate EaE Group Ltd., a U.K. subsidiary of a Swiss company called Inspectorate International SA, which has its own computer leasing operations in Europe and the U.S.

United, which was founded in 1972, has 250 employees and operates in the major European markets and in the U.S. In 1986, it maintained its dp revenues despite divestment of its microcomputer systems company United Business Systems, which was bought by U.K.-based Micro Business Systems plc. United Business Systems had contributed around £20 million to United's 1985 dp revenues.

Most of United's 1986 revenues, however, came from mainframe leasing, particularly IBM 3090 machines. By the end of September of last year, United's chairman Parry Mitchell claimed to have signed 60 contracts for the 3090 systems.

The company did well outside the U.K., too. Its U.S. subsidiary Unilease Computer Corp., helped by the changing U.S. tax laws, performed well and was ranked as the third-largest independent IBM computer leasing company in the U.S. United's French and West German subsidiaries, though smaller, also showed healthy growth rates. The West German operation "grew dramatically last year," claims a company spokeswoman. Now, the whole United operation will become part of Inspectorate, which is aiming to merge all its leasing operations in Europe and the U.S. While the merger will see the end of the old United Leasing, it will create an even bigger force in the world leasing market.

93

COMPUTER ASSOCIATES INTL.

711 Stewart Ave.
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(516) 227-3300

An aggressive acquisition program has helped this software company nearly double its revenues every year since 1983. Last year was an especially busy one as the company bought Integrated Software Systems Corp. (ISSCO), a $40 million graphics software company; Software International, which sells financial applications software for IBM and Digital Equipment Corp. computers; and the Mega Group, which sells Megacalc, a spreadsheet package for mainframe computers. ISSCO brings Computer Associates into the graphics software business. Software International's Masterpiece financial management products will be integrated with Computer Associates' Advanced Business Software products, and the Megacalc product will be combined with the company's microcomputer spreadsheet product called SuperCalc 4.

These recent acquisitions are in addition to a half dozen others Computer Associates has made in the last three years in its stated goal to provide "all of the software needs of clients." Its clients are big companies, users of IBM and compatible mainframe computers and minis and micros.

Its revenues of $264.9 million last year were up 55% from 1985's $170.4 million; earnings soared 81% to $30.5 million. These figures, the company notes, included fourth-quarter results of ISSCO, Software International, and the Mega Group.

Computer Associates, formed in 1976, was a latecomer to the business of being an independent developer and supplier of IBM systems software. Through the acquisitions and some internal development, it became a supplier of applications software as well.

The company reported spending $34.7 million on new product development in 1986, about 13% of revenues.

94

NOMURA COMPUTER SYSTEMS CO. LTD.

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Nomura Computer Systems Co. Ltd.'s problem in 1986 was that it "grew too fast" to keep things running smoothly. No matter, though: a 23% jump in revenues to ¥44.4 billion ($263 million), along with the 30% rise in the value of the yen itself, made Nomura the first Japanese dp services company to make it onto the DATAMATION 100.

Nomura Computer Systems (NCC) is the former computer division of Nomura Securities, one of Japan's big securities firms. It became independent in January 1966, and still earns 40% of its revenues from Nomura group companies, which own 5% of its stock.

Around 65% of NCC's revenues come from what the company simply calls "operations," centered around the NCC VAN (value-added network), which serves almost 5,000 customers via 40,000 terminals throughout Japan and handles as many as 12 million transactions daily. The VAN actually includes about 10 different networks, the largest of which, with 8,000 terminals, is used by the Ito-Yokado department store chain. Another is an information exchange system that connects 1,500 retailers, distributors, and manufacturers of general consumer goods, and handles ordering, account settlement, invoicing, and shipping information.

For the financial industry, NCC has a joint on-line securities information and transaction processing system called STAR-II. The largest such system in Japan, it is used by 37 major firms, including 12 of the 24 foreign companies in town, and handles 30% of the transactions on the Tokyo Stock Exchange, according to NCC. The system, along with the company, is also in the process of going international. An English language version with multicurrency and international networking capabilities, called I-STAR, has been developed.

In October, NCC opened a U.S. subsidiary, NCC-America, to establish a computer center at the Staten Island teleport in New York. That center will be linked to the system in Japan, and to the NCC-Europe center to be established later, providing an international network. The main target is Japanese securities firms moving overseas.

95

PARADYNE CORP.

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This manufacturer of data communications equipment suffered through a year of deepening financial losses and continuing legal troubles related to a controversial 1981 contract with the Social Security Administration. (The legal issues arose from the firm's allegedly representing another company's gear as its own in order to win a $115 million Social Security contract.)

By March 1987, however, Paradyne had apparently settled its legal problems with the government by pleading guilty to one charge of conspiracy and by ousting Robert S. Wiggins as president and chief executive officer. His successor is Jerry Kendall, the former executive vice president and chief operating officer who has been with the company for many years. In return for the guilty plea, the government dropped bribery and perjury charges against Paradyne, freeing it to reenter the federal contract arena. In addition to paying fines and costs of $1.2 million, Paradyne settled a shareholders' suit with a payment of $8.1 million.

The fines and settlements contributed to losses for the year totaling $38.5 million. Total revenues were $261.1 million. Comparable figures for 1985 were a loss of $31.2 million on revenues of $252 million. Despite first quarter 1987 losses, the company said it was "optimistic" about this year's prospects.

Paradyne attributed the poor results to a slow economy, "continuing softness" in the datacom market, and its protracted legal battles. Profit margins, it said, were adversely affected by high costs owing to low shipment volumes, an $8.3 million write-off of obsolete inventory, product design changes, and legal fees. The company cut its payroll by 8% in an effort to cut costs.

The firm's product line includes dial-up and leased-line modems, packet switching equipment, terminals, multiplexors for T1 and slower lines, and data encryption devices. It also assembles circuit boards for other manufacturers. New products introduced last year included the Model 3210 network performance management system, numerous modems and multiplexors, and a data network offering called NetCare.

96

MICROSOFT CORP.

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It was a year of significant milestones for Microsoft Corp. The company that doubled its sales and earnings two years in a row after its MS/DOS operating system was chosen in 1981 for IBM's first personal computer took these big steps in 1986: it went public, raising $45 million; moved its corporate offices to a 29-acre campus in Redmond, Wash.; finally brought out its Windows operating environment; and became the second microcomputer software concern behind Lotus Development Corp. to make the DATAMATION 100.

Microsoft's $260.2 million of revenues in 1986 soared 60% over 1985's $162.6 million. Equally pleasing were its $57.6 million earnings. (Estimates for its current fiscal year, ending June 30, are for revenues to exceed $300 million and for earnings to increase to $70 million.) Over 40% of Microsoft's business is outside the U.S.

Microsoft was formed in 1975 as a partnership by William H. Gates, now chairman and ceo, and Paul G. Allen, who has left the company to establish a new software company. It sells some 40 software products: three operating systems and six categories of applications software. It is best known for MS/DOS, the operating system it designed in 1981 that is now running on over 4 million IBM PCs and compatibles. Its Unix-based operating system, Xenix, accommodates transaction-oriented data processing on micros.

Its Excel spreadsheet software for the Macintosh computer is considered by Lotus's R&D people to be a legitimate competitor to 1-2-3. Microsoft is now developing a version of Excel for IBM's new line of PCs. But because IBM is building Microsoft's Windows into its new Personal System/2 microcomputer line announced this spring, it is with that product that the company is expected to have the most success.

Windows, which allows users to run several programs simultaneously and provides drop-down menus, icons, and mixed text and graphics, makes it much easier to use micros. With IBM adopting Windows, clone makers will be forced to offer the same capability; that is, they will have to buy licenses from Microsoft to use Windows.

97

3M

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3M is having a tough time competing in information technology markets, but the giant multinational is sticking to the fight. Dp revenues dropped nearly 14% in 1986 to $255 million, following a lackluster 1985 in which dp revenues hit $295.4 million.

Even though that is an infinitesimal part of last year's $8.6 billion in total revenue, 3M considers computer technology to be a big factor in achieving its stated goal of 10% annual growth in earnings. In recent years, the goal has been consistently missed.

Dp losses stem from intense price competition in the magnetic media field with Japanese giants such as Sony and TDK. While figures aren't available from 3M, analysts say the company's videotape and floppy disk operations have lost tens of millions of dollars in price-cutting wars with the Japanese. These analysts add that 3M will stay with the magnetic media business, which has grown rapidly in recent years. Some years ago, 3M dropped its audiotape line because of Japanese competition, and two years ago it bowed to the Japanese in the copying machine market when it formed a joint venture with Harris Corp. to make copiers and facsimile machines.

Its Information Systems & Data Processing group, on the other hand, foresees a bright future with its systems for storing, retrieving, and distributing documents. 3M plans to introduce electronic document management systems, software, plain-paper reader/printers, and a film plotter that increases productivity in computer aided design.

Allan J. Huber, head of the Electronic & Information Technologies group, says dp R&D spending is increasing every year. Across the company, 3M last year spent $564 million, or 6.6% of sales, on R&D, an increase of 11% over the year before. The company also has 100 research agreements with 50 universities around the world, with government laboratories, and with other companies through strategic alliances.

3M says it made major advances in optical disk research last year. It is believed to have invested $100 million to develop and manufacture prototypes of 5¼-inch and 12-inch optical disks. By 1990, 3M predicts, there will be a $1 billion market, growing 30% a year after that. Huber says he expects 3M to capture 35% to 40% of that market, "and in some segments more than that." The company is said to have at least a year's

98

EASTMAN KODAK CO.

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Rochester, NY 14650
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Although it called the free world economy "sluggish," Eastman Kodak recorded a 9% increase in worldwide sales last year to $11.5 billion and a 12.6% rise in earnings to $374 million. (Earnings the previous year were affected by a $494 million write-off when the company was forced out of the instant photography business after lengthy litigation with Polaroid Corp.) The year was one of restructuring for Kodak: budgets across the company were slashed by 5% and 7,500 employees (6%) were cut from the payroll.

DATAMATION estimates Kodak's dp sales—including its electronic publishing business, mass storage products, and Atex Inc.—were $250 million in 1986, up 19% over 1985. The increase was primarily due to the acquisition of Eikonix and increased sales of KEEPS, (Kodak Electronic Publishing System).

In 1986, Kodak introduced an information storage and retrieval system that can access documents stored in optical disk drives or on microfilm, called KIMS (Kodak Image Management System). It makes use of 12- and 14-inch disks, Digital Equipment Corp. computers, and Hitachi Ltd. optical drives. Prices range from $150,000 to $700,000.

The company stepped up its optical disk offerings with the 6800 model of 14-inch optical storage disk. Kodak said the disk can store three to four times as much information as a 12-inch disk. Full-scale production of the 14-inch disks will begin early next year.

Kodak's Atex, of Bedford, Mass., is a supplier of computer-based editing and production equipment to newspapers and magazines. It was combined with the recently acquired Eikonix Corp. into the new Electronic Pre-Press Systems Division. Eikonix makes a digital color editing and separation system. Atex has had little revenue growth over the years and is believed to be losing money. Kodak's other data processing operation, Verbatim, a magnetic disk manufacturer acquired three years ago, was moved to North Carolina from California.

99

EMHART CORP.

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Emhart Corp., a $2 billion diversified manufacturer of industrial and consumer products, entered the computer business last December when it acquired Planning Research Corp. (PRC) of McLean, Va. The 33-year-old computer-based service company reported data processing-related sales of $248.5 million in 1986, an increase of 22% over the prior year. But divestitures and heavy expenditures for new product development weakened the company's earnings. It was about to report a $2 million loss when it was acquired by Emhart early in December.

It was the 22% figure that attracted Emhart, whose growth rate has paralleled that of the gross national product, or about 2% in recent years. Last year, Emhart wrote down $150 million to streamline its operation and then paid out about $210 million for Planning Research, a company that despite its recent fast growth, has, according to its former chairman and ceo John Toups, "lacked the long-term financial stability [of Emhart]." Toups retired in February to join the Emhart board. He was succeeded as head of PRC by Wayne Shelton, a 24-year PRC employee.

In July, Shelton put the company's lagging civil engineering group up for sale, taking a $13.4 million loss. It developed a new generation of products for its realty systems group at a cost of $3.4 million, paying the bill from the earnings of its Business Information Systems operation. PRC's two other operating groups—Government Information Systems and System Services—were each doing well, winning between them nearly $202 million in new contracts.

Essentially a conglomerate of about two dozen subsidiaries and partnerships providing computer-based services and software development, PRC has always maintained a high R&D budget. The $1 million it spent in fiscal year 1986 represented a 67% increase over the previous year. It also invested $4.6 million in developing and upgrading products, an increase of nearly 75% over the year before.

100

RECOGNITION EQUIPMENT INC.

2701 E. Grauwyler Rd.
Irving, TX 75061
(214) 579-6000

This 25-year-old company has prospered mightily through the current dp industry slump by identifying a series of market niches, all associated with data capture, and by bringing a potent blend of technical and marketing expertise to bear. Spurred by a growing demand for optical scanning equipment, Recognition Equipment Inc.'s net profits soared some 163% to $11.3 million and sales jumped 51% to $246.6 million over the calendar year.

Over the past three years, the company has more than doubled its size through acquisitions, a changing product mix, and an increased customer service orientation. REI's strategy has been to buy an installed base, both as prospects for a broadening product range increasingly based on an open Unix architecture, and for the lucrative ongoing service business. One very large customer, the Federal Reserve, for example, pays some $400,000 a month for maintenance of its currency processing systems, according to one REI insider.

REI's maintenance and repair business grew 66% to $115 million—almost half the company's total revenue. During the year, as part of an internal program known as Redirect, the Field Engineering Division was renamed Customer Service and given a much broader mission, including the selling of supplies, contract programming, and a myriad of other hand-holding services—all as part of a "partnership" drive with the customer base.

Recognition has enjoyed a tenfold increase in its customer count over the past three years, most notably through the acquisition in late 1985 of five European marketing subsidiaries of Mohawk Data Sciences. These operations in Belgium, Denmark, France, Sweden, and West Germany became profitable in 1986 and helped boost European sales to 38% of the total at the end of the company's fiscal year (late October). REI also beefed up its Far East operation, and successes in Australia and Japan helped raise Asian revenue to 8% of the total, from 2% in 1985.

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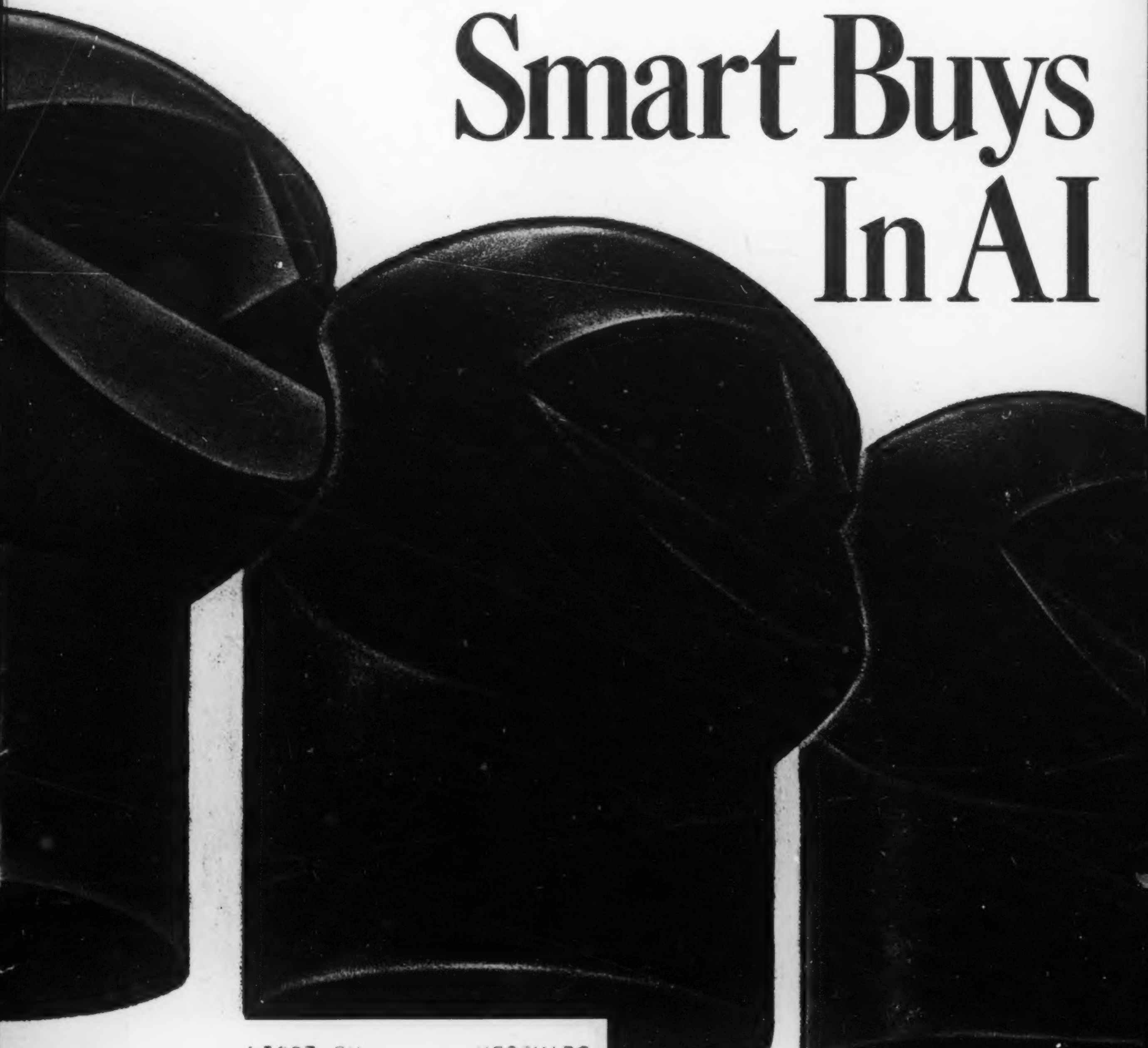

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THE EUROPEAN 25: HOT COMPANIES IN A HOT MARKET

DATAMAT

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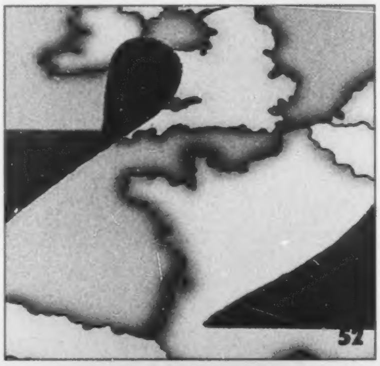

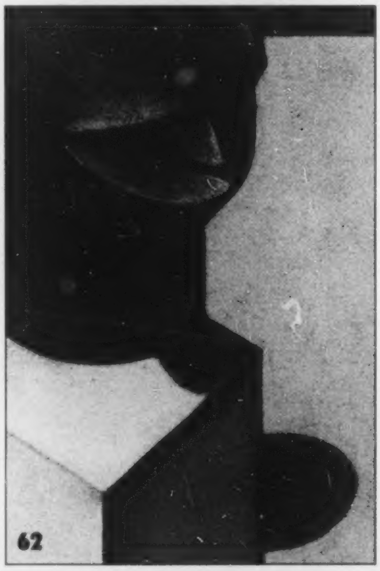

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When Arthur Andersen & Co. set about developing a mainframe-based oil and gas accounting system, the accounting firm saw it as a prime candidate for AI-based functional prototyping. Described here is the development process integrating the use of this technique.

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Altos launches 386 multi-user system running Xenix System V.

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September is the month of the micro, and it's packed with pc shows, such as PC Expo.

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BY G. RUSSELL PIPE
GATT has opened negotiations to set rules on international services trade, including telecom. What worries many major telecom players and some users is that the process will bypass, and threaten, the existing regulatory structure.

-12 **Cashing In on the Currency Game**
BY SARAH UNDERWOOD
The weakened dollar has presented leasing companies with the opportunity to buy IBM equipment in the U.S., then offer the machines to European and Japanese customers at very competitive prices.

Cover Illustration by Douglas Fraser

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1987 JESSE H. NEAL AWARD

Editorial

Year of the Customer

This is indeed the year of the customer in the information technology industry. End-user companies large and small are having more say in the direction of their suppliers of systems and software than ever before. They have gone beyond merely asking for solutions to their complex business problems; they are demanding answers—today.

It's no surprise then that the DATAMATION staff devotes more and more of its reporting efforts finding out exactly what customers want—need, really—from their strategic suppliers. Here, for example, are some of the customers with whom our correspondents in Boston, San Jose, and Los Angeles touched base in the course of their travels for this issue:

- Chevron Corp., Dow Chemical, Hughes Aircraft, and Syntex all were more than willing to share their thoughts about IBM's NetView SNA management products with San Jose-based Susan Kerr, who specializes in communications. In fact, Chevron's general manager William Houghton told Kerr, "If promises meet expectations, this could be a best-seller."
- The Bank of New England and the Texas Commerce Bank discussed their impressions of IBM's SolutionPac strategy with Jeff Moad, our San Jose bureau manager. Moad's impressions are that Big Blue's attempt to offer vertical software, service, and support hasn't had much of an impact—in banking or anywhere else.
- AT&T, Citizens Fidelity Bank, and Owens Corning Fiberglas Corp. explained to our man in Los Angeles, Tom McCusker, why they are investing in software tools to measure their existing computers' performance.
- The Bank of Boston, Guardian Industries, and Life of Virginia all had something to say to Boston bureau manager Gary McWilliams about the future of minicomputers, the subject of our Behind the News section. Situated in Newton, Mass., McWilliams is in a perfect position to have tackled the assignment—the headquarters of many of the leading minicomputer vendors (Digital Equipment Corp., Wang, Data General, and Prime) are within a short drive of his office.

That's not to say we ignore suppliers these days. Our bureau reports, as well as international editor Paul Tate's DATAMATION European 25 feature, are based on numerous interviews with executives from top vendors such as Digital, IBM, and Uccel (now part of Computer Associates). We feel quite comfortable bridging the gap between customers and suppliers—especially this year. After all, that's our job.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

The European

DATAMATION Maps the Major Powers In the European Dp Market

Model by Kathy Jeffers and photograph by Walter Wick

A weak dollar and a steady demand for software, minicomputers, and pcs characterized the European dp market in 1986. These factors helped both U.S. and indigenous dp suppliers to maintain revenue growth. Although IBM had a rough time in some of its major markets, overall it was a good year for the high and mighty in European dp.

BY SARAH UNDERWOOD
AND PAUL TATE

The combination of the weak U.S. dollar and the continued steady growth in Europe's main markets helped the 25 highest and mightiest European dp companies smash through the $40 billion barrier in 1986. The combined revenues of the top 25 companies in Europe last year—$44.5 billion—represents an impressive increase of 29% over 1985.

For most of the U.S. dp companies facing depressed revenue increases in their home market, Europe provided a growth opportunity not to be missed in 1986. But while U.S. suppliers sought to bolster flagging corporate revenues with strong overseas sales, Europe's indigenous suppliers more than held their own. Last year, the European dp market—valued at over $70 billion—helped firms from both sides of the Atlantic achieve revenue growth.

Though the mainframe market only showed modest increases in most countries, the demand for minicomputers, personal computers, and communications products was strong.

The 1986 DATAMATION European 25 survey also reveals a number of more specific trends. The revenue difference between the first- and last-place firms on the list was again considerable. While IBM, taking its traditional place in the number one position, recorded European dp revenues of $15.7 billion in 1986, Data General was in the chart's basement with sales of $283 million. That revenue threshold for entry to the top 25 is much higher than the $219 million level in 1985, due, for the most part, to the effect of the weak dollar on currency conversions.

The weak dollar, however, does not account for IBM's changing fortunes in Europe during 1986. Big Blue's European sales represented 35.3% of the European dp industry's 1986 combined revenue total, compared with 39% in 1985 and 1984. In fact, IBM's performance in Europe last year was not at all impressive. Although the company recorded an increase of 21% in dollars for the year in Europe, that figure hides the real story—IBM suffered badly in many of its major markets. For example, in West Germany, which is IBM's largest European market, the company's dp revenues fell drastically, by almost 13%, despite the market's overall growth of around 17% over the same period. In France, the second-largest revenue producer for IBM in Europe, sales were off by 9% (see Figure 2).

Despite these problems, the weak dollar helped IBM convert its modest achievements in Europe into an impressive 21% increase overall in dollars. This came as welcome relief in its Armonk, N.Y., headquarters, because the company's business at home had been even worse. This is reflected in the fact that Big Blue's European revenues accounted for 32% of its worldwide dp sales—up from 28% in 1985.

By contrast, most of the European companies had little trouble maintaining genuine growth rates either within Europe or worldwide. There are 14 European companies from seven countries on this year's DATAMATION European 25, compared to 13 in 1985. These European firms accounted for 41% of the combined revenue total of the 25 companies in 1986, up from 35.5% in 1985.

A BRITISH LEASING FIRM WAS THE BIG CLIMBER.

What's more, the combined worldwide revenues of the top 20 European-owned companies (see Figure 1) rose to $23.4 billion—an increase of 36.6% over the previous year.

This healthy growth among the major European vendors did not affect the positioning of companies at the top of the European 25 table, however. With IBM still in its unassailable number one slot, West Germany's Siemens remained at number two, with 14.5% growth on 1986 revenues of $3.9 billion. If its foray into the U.K. computer market, which began last year, turns out to be successful, then it can expect to do even better in 1987.

Meanwhile, Digital Equipment Corp. kept its number three position with another strong year, registering European revenues of $2.8 billion, while Italy's Olivetti and France's Groupe Bull maintained their respective number four

FIGURE 1 **Leading European Dp Companies**

	COMPANY	COUNTRY	WORLD-WIDE DP REV ($ MIL)	% CHG ACTUAL ACCTG CURRENCY
1	**Siemens AG**	W. Germany	$4,387.1	10.5
2	**Ing C. Olivetti & Co. SpA**	Italy	3,865.2	14.5
3	**Groupe Bull**	France	2,568.0	10.4
4	**Nixdorf Computer AG**	W. Germany	2,075.1	14.3
5	**N.V. Philips Gloeilampenfabrieken**	Netherlands	1,763.3	–4.7
6	**STC plc**	U.K.	1,748.7	14.5
7	**LM Ericsson**	Sweden	1,344.2	–9.3
8	**Compagnie Générale d'Electricité**	France	1,025.0	7.6
9	**BASF**	W. Germany	520.7	7.6
10	**Mannesmann Kienzle GmbH**	W. Germany	488.9	1.4
11	**Racal Electronics plc**	U.K.	469.1	7.4
12	**Rank Xerox**	U.K.	458.8	70.0
13	**Atlantic Computers plc**	U.K.	431.0	67.4
14	**Cap Gemini Sogeti**	France	419.9	32.2
15	**Ferranti plc**	U.K.	351.5	8.6
16	**Norsk Data AS**	Norway	349.1	36.6
17	**British Telecom plc**	U.K.	330.4	44.9
18	**Plessey Co. plc**	U.K.	294.1	2.5
19	**Nokia Corp.**	Finland	273.4	2.7
20	**United Leasing**	U.K.	267.6	NA

NA: not available

FIGURE 2 **IBM Europe's Major Markets**

COUNTRY	1986 LOCAL SALES REV ($ MIL)	% CHG $ U.S.	% CHG AAC	1986 TOTAL REV ($ MIL)*	% CHG AAC	NET INCOME ($ MIL)
France	2,672.2	18.1	–8.9	5,285.3	–2.5	356.7
W. Germany	3,319.4	18.3	–12.7	5,540.6	–9.1	238.7
Italy	2,020.0	31.6	2.8	3,007.9	4.8	363.5
Netherlands	842.4	24.6	–8.1	1,313.1	–6.2	102.0
Spain	789.0	29.6	6.6	1,286.9	–6.2	154.9
Sweden	597.3	21.3	0.5	1,102.3	7.6	79.5
U.K.	2,420.6	29.2	12.7	4,526.5	1.2	385.3

*These figures include intercompany transfers. AAC = Actual accounting currency

and number five rankings, with each recording growth rates of around 12% in local currency.

Data General reentered the list at number 25 after having been knocked off the chart in 1985. The minicomputer company's 31% increase in European sales reflected last year's strong growth of Europe's mini market. That trend benefited Digital and helped Norway's fast-growing mini maker Norsk Data enter the rankings for the first time, at number 23, with revenues of $318 million and an astounding 84% sales increase, measured in local currency.

Xerox's European joint venture, Rank Xerox, also climbed back into the rankings during 1986 after dropping off the chart in 1985. Rank Xerox's 1986 dp sales of $371.6 million were up by a hefty 48% over 1985, putting the company into the 21st position in 1986.

Falling off the chart in 1986 was the U.K.'s recently privatized telecommunications authority, British Telecom. The incorrect inclusion of dp revenues garnered from internal sales had placed it at number 15 in the 1985 ranking, but after the proper adjustments were made in the 1986 survey it dropped off the table. The merger of Burroughs and Sperry to form Unisys accounts for the second slot that was filled by a newcomer. Unisys grabbed the number six position on the 1986 chart, knocking West Germany's Nixdorf down one place to number seven, despite its respectable 18% increase in sales, measured in deutschmarks.

But the European company that really took a nosedive last year was Sweden's ailing telecommunications company, L.M. Ericsson, which fell four places to number 12 after a disastrous 9% drop in European sales. That fall follows a two-place slide in 1985, and while some say most of its problems are now sorted out on the dp side, Ericsson has an enormous task ahead of it to regain ground in the European marketplace.

Ericsson's continuing fall from grace, and the merger of Burroughs and Sperry, helped many other firms move up the rankings in 1986. The Dutch Philips group managed to rise one place to number eight despite only a modest 5% increase in sales. Also moving up one position was U.S. micro company Apple Computer Inc., which benefited from strong European demand for its Macintosh. Apple's European revenues were up by 42%, measured in dollars, to $325 million. Office systems specialist Wang Labs also recorded a healthy growth rate of 34% and moved up one rung to the number 15 position.

The big climber in 1986 was U.K. leasing company Atlantic Computers plc, which jumped five places to number 20 after entering the chart for the first time in 1985 at number 25. The company's 50% growth surge was largely a result of increased numbers of high-value leases for IBM 3090 mainframes.

Climbing four places to number 13 was France's telecom giant Compagnie Générale d'Electricité, which recorded dp revenues in Europe of $943 million, up by 10% in local currency. This company will not appear on the chart next year, however, due to the merger of its dp and communications interests with ITT.

Recording much stronger growth in its business last year was U.S. company Hewlett-Packard, which saw its European sales grow by 37% to $1.5 billion, pushing it three places up the ladder to number nine. Five companies edged up two places in the 1986 survey: NCR, Control Data, and Commodore from the U.S., and Mannesmann and BASF from West Germany. Only six companies remained in the same position as last year.

Last year was also one of corporate partnerships, a continuing trend in Europe, which again affected many of the top 25 companies. Bull tied the conjugal knot with Honeywell Information Systems and Japan's NEC, while Olivetti broadened its horizons with the acquisition of Triumph-Adler from Volkswagen.

Siemens and BASF merged their pcm businesses into a new force in the European pcm world: Comparex Information Systems, which will focus on selling Hitachi-built mainframes to European customers. Troubled Ericsson, meanwhile, teamed up with DEC to supply banking systems, and French services house Cap Gemini Sogeti went to the U.S., West Germany, and Italy to acquire firms.

Companies breaking into the value-added network (VAN) services market were among the most ardent suitors. IBM France started discussions with the French bank Paribas and Paris-based services house Sema-Metra. Bull entered similar talks with GEISCO and, in the already deregulated U.K. market, ICL also tied up with GEISCO. By the end of the year, Italy was also considering the potential of VANs, and IBM Italia was just weeks away from signing a deal to set up a service provider with Olivetti.

In the more traditional services sector—software, consultancy, processing, and training—growth remained strong through 1986. The European Computer Services Association says business grew 19% in real terms to a value of $23.5 billion last year.

The European market is now more than half the size of its U.S. counterpart. In the European services market, packaged software accounted for 36%, custom software and consultancy for 29%, processing services for 31%, and training for the remainder.

On a country-by-country basis, the U.K., Italian, and West German markets showed growth in excess of 20%, while Spain was Europe's up-and-coming dp market, claiming 25% growth in its services sector. The French market, home of Europe's biggest software and services suppliers, expanded just 16%.

On the hardware side, the 1986 mainframe market experienced only modest increases although the year was notable for IBM's additions to the 3090 line, the emergence of the new Comparex pcm company in West Germany, and the unrest among Sperry users following the merger with Burroughs.

Further down the power spectrum, the attractive price/performance ratings of Digital's VAX and MicroVAX won the hearts of both value-added resellers and users, while Hewlett-Packard booked orders for its Spectrum machines, and Norsk Data proved that its computer range could take its place with the best of the competition.

Unix was a hot topic during the year. Most of the European majors prepared new systems or launched Unix products in 1986, a trend that has continued this year. The X/Open group, boost-

The DATAMATION European 25

1986 RANK	1985 RANK	COMPANY	HEAD-QUARTERS	1986 EUR DP REV	% CHG $ U.S.	% CHG AAC*	TOTAL DP REV
1	1	**IBM**	U.S.	$15,688.7	21.1	21.1	$49,591.0
2	2	**Siemens AG**	W. Germany	3,860.6	46.5	14.5	4,387.1
3	3	**Digital Equipment Corp.**	U.S.	2,776.7	27.4	27.4	8,414.3
4	4	**Ing C. Olivetti & Co. SpA**	Italy	2,705.6	45.2	12.9	3,865.2
5	5	**Groupe Bull**	France	2,413.9	44.6	11.7	2,568.0
6	—	**Unisys Corp.**	U.S.	2,263.4	NA	NA	9,431.0
7	6	**Nixdorf Computer AG**	W. Germany	1,909.1	60.1	18.1	2,075.1
8	9	**N.V. Philips Gloeilampenfabrieken**	Netherlands	1,534.1	42.3	4.9	1,763.3
9	12	**Hewlett-Packard Co.**	U.S.	1,485.0	36.9	36.9	4,500.0
10	10	**STC plc**	U.K.	1,422.5	37.0	19.5	1,756.2
11	13	**NCR Corp.**	U.S.	1,225.7	31.4	31.4	4,377.6
12	8	**LM Ericsson**	Sweden	1,196.3	9.0	-9.4	1,344.2
13	17	**Compagnie Générale d'Electricité**	France	943.0	42.5	10.0	1,025.0
14	14	**Honeywell Inc.**	U.S.	699.3	43.3	43.3	1,890.0
15	16	**Wang Laboratories Inc.**	U.S.	587.2	34.4	34.4	2,668.9
16	18	**Control Data Corp.**	U.S.	502.0	18.6	18.6	3,346.7
17	19	**Commodore International Ltd.**	U.S.	456.0	14.7	14.7	800.0
18	20	**Mannesmann Keinzle GmbH**	W. Germany	444.9	38.9	2.6	488.9
19	21	**BASF**	W. Germany	411.4	45.8	7.6	520.7
20	25	**Atlantic Computers plc**	U.K.	395.9	80.4	49.7	431.0
21	—	**Rank Xerox**	U.K.	371.6	70.0	47.6	458.8
22	23	**Apple Computer Inc.**	U.S.	325.0	42.6	42.6	2,031.0
23	—	**Norsk Data AS**	Norway	317.7	150.0	83.6	349.1
24	—	**Cap Gemini Sogeti**	France	293.9	51.8	17.2	419.9
25	—	**Data General Corp.**	U.S.	283.3	31.3	31.3	1,287.6

All currency figures are in millions. NA = not available. *Actual accounting currency.

ed by the addition of Digital, Unisys, and Hewlett-Packard to its membership list, pressed ahead with its concept of a common applications environment and produced further specifications that will be adopted by its member companies in products to be launched this year.

In the European micro market too, standards became a point for discussion as rumors of IBM's 1987 launch of PS/2 began to circulate. In terms of market share, however, IBM took a beating last year at the hands of clone makers such as Olivetti and the U.K.'s micro upstart Amstrad. While IBM did not dominate the total pc market—from home computers to scientific and technical workstations—it did hold sway in the business and professional pc market sector. But it achieved no growth, reports International Data Corp., with unit shipments flat at 330,000 units. Compaq and Siemens were the star performers last year, turning out 65% and 150% more pcs, respectively.

These trends in the hardware sector seem set to continue during 1987, leaving IBM with some tough marketing decisions to make if it's to maintain its hold on the European market. The new PS/2 will definitely be a big help at the pc and departmental systems level, but with the strengthening of many European companies during 1986 at Big Blue's expense, with the continued rise of the minicomputer firms in Europe and the corporate mergers that got under way last year in the European mainframe and communications sectors, 1987 is going to be a critical year in European dp.

Methodology

For this survey, Europe includes Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, the U.K., and West Germany.

Dp-related revenue is defined as general purpose dp products and services generated by one or more of the following categories or equipment: mainframes, minicomputers, office systems, data communications, peripherals and terminals, software and services, and maintenance and repair. Excluded are data transmission or "basic" services revenues from specialized common carrier, standalone electronic and mag card typewriters and standalone electronic cash registers, instrumentation, semiconductors, printed circuit boards, automated test equipment, and dp supplies, with the exception of magnetic media for disk and tape drives.

All peripherals that attach to a system are included. For computer-based manufacturing systems, such as computer-controlled machine tools, only computer and hardcopy output devices are included and not the tools themselves. All revenue and earnings figures have been adjusted to calendar year calculations. All European company figures were converted to U.S. dollars, using OECD exchange rates. ■

TOTAL DP REV % CHG	1986 TOTAL REV	EUR DP REV AS % OF TOT DP REV	DOM REV AS % OF TOT DP REV	DP REV AS % OF TOTAL REV	NET INCOME	1986 EMPLS	FISCAL YEAR END
2.1	$51,250.0	32	49	96.7	$4,789.0	403,508	Dec.
49.8	21,669.6	88	65	49.8	679.3	363,000	Sept.
19.7	8,414.3	33	56	100.0	861.5	101,000	June
46.5	4,902.3	70	37	78.8	378.9	59,091	Dec.
10.5	2,568.0	94	66	100.0	39.1	26,804	Dec.
NA	9,536.7	24	69	98.8	254.3	98,300	Dec.
54.8	2,075.1	92	52	100.0	102.3	25,576	Dec.
29.1	22,464.1	37	NA	7.8	414.3	344,200	Dec.
12.0	7,102.0	33	53	63.3	516.0	82,000	Oct.
31.9	2,794.1	81	63	62.5	151.6	NA	Dec.
12.7	4,881.6	28	49	89.6	336.5	62,000	Dec.
9.4	4,444.4	89	NA	30.2	53.1	75,000	Dec.
39.4	11,673.9	92	48	8.7	248.2	150,000	Dec.
–3.2	7,268.2	37	55	26.0	–9.6	98,597	Dec.
9.9	2,668.9	72	64	100.0	–86.4	31,000	June
–9.1	3,346.7	15	70	100.0	–264.5	34,200	Dec.
6.7	837.7	57	32	95.5	–10.0	NA	June
37.4	627.6	91	65	77.9	NA	8,864	Dec.
45.8	18,650.2	79	NA	2.7	NA	131,468	Dec.
92.0	470.6	92	62	91.5	29.9	630	Dec.
70.0	2,832.4	81	—	16.0	202.0	NA	Oct.
15.8	2,031.0	16	74	100.0	155.3	5,940	June
58.8	349.1	91	55	100.0	468.0	3,618	Dec.
71.3	419.9	70	37	100.0	27.4	7,500	Dec.
7.4	1,287.6	22	64	100.0	–26.8	15,565	Dec.

DATAMATION.

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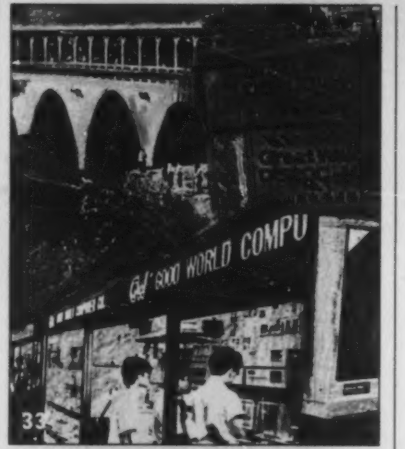
Behind the News
After exclusive interviews with Chinese officials, Paul Tate and John H. Maier file their report, "Dateline Beijing: The China Syndrome," which explores China's attempts to step up the pace of computerization in its society and the implications both for the country's national computer industry and its relations with the foreign firms with whom it did $50 billion worth of business in 1986.

FEATURES



46 COVER STORY: Industry by Industry IS Survey
What are your competitors spending on information systems? DATAMATION's survey of 120 large U.S. companies in 12 industries shows that the average MIS budget at the top U.S. companies is about 2% of total revenues, but big users in heavily automated industries can spend over 6% of revenues on computing. This year, their IS spending will approach or top $30 billion. Here's how IS execs in those top shops allocate their world-class resources.

92 Living with the High Yen
BY ROBERT POE
In 1986, Japan was the land of the rising yen. The 29% ascent in value over the dollar left the IS suppliers that comprise DATAMATION's Japan 10 unable to protect their bottom lines—especially IBM Japan. But the sun also rises: the market for IS experienced reasonable growth and user budgets in Japan increased.

98 Network Management: Keeping the Connection
BY BILL MUSGRAVE
With all the tools now available to monitor virtually every piece of a datacom network, the vital function of network management should be as easy as, oh, building a tower in Babel. The hitch here, too, is communications, involving common carriers, common standards, and some basic equipment incompatibilities.

ION

REAL TIME

4 **Letters**
A segment producer for ABC's *20/20* writes that our recent article on software bugs helped put the issues involved in focus; the author of *Crunch Mode* responds to our review of his book; and a professor of industrial psychology comments on our story on establishing shift schedules for an around-the-clock operation.

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Apollo and Sun unveil "super" workstations.

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The first upgrade of Lotus's T-A-C is released.

122 **People**
Ellen Lapham takes risks, whether they involve starting up computer companies or attempting to climb Mount Everest.

123 **Calendar**
This is the month for Info '87 in New York.

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Does not appear in all copies.

-5 **India's Soft Hopes**
BY ROBERT POE
For India, the passage to the world technology market is software development. India boasts low labor costs and a high level of technical expertise, but restrictions on the use of foreign currency reserves to purchase developmental hardware—not to mention the defection of professionals to the U.S.—are among the problems in its path to a leading role in the field.

Cover Illustration by Javier Romero

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AWARD

Editorial

Breaking Down The Great Wall

INTERNATIONAL EDITOR
PAUL TATE

Although diplomatic and business channels between China and the rest of the world have grown increasingly wider in the last two decades, the country is still forbidding to multinational end users and information technology vendors trying to set up shop there. Last year, China traded $50 billion in goods and services with other countries. Yet, U.S., European, and Japanese executives forming strategies for doing business in and with the country of more than 1 billion people still view the journey ahead as difficult.

That's why DATAMATION sent international editor Paul Tate to China in the early summer. Tate finds that the Asian giant's efforts to use information technology to build a modern economy and to support a massive expansion in international trade is going in slow motion. "For international companies, especially those selling technology-based services or technology products, it makes doing business with China as complicated as a Chinese puzzle," Tate reports. Chinese authorities, he discovers, are doing everything possible to make the puzzle less complicated. The exclusive Behind the News report, "Dateline Beijing: The China Syndrome" (p. 33), we believe, contributes to that effort.

On his return from China to his London base, Tate stopped off in Japan long enough to give Tokyo bureau manager Robert Poe a hand at compiling our annual ranking of the top 10 information systems companies doing business in Japan ("Living with the High Yen," p. 92). The pair analyze the impact of the appreciation of the Japanese yen against the U.S. dollar, discerning that the shift dampened the bottom lines of IS suppliers far more than the appetite of Japanese customers for computers and communications equipment.

Tate has returned to London and his usual beat managing DATAMATION's international coverage, while Poe continues to monitor developments in the Pacific Rim.

Tim Mead
TIM MEAD
EDITOR-IN-CHIEF

Behind the News

SPECIAL REPORT

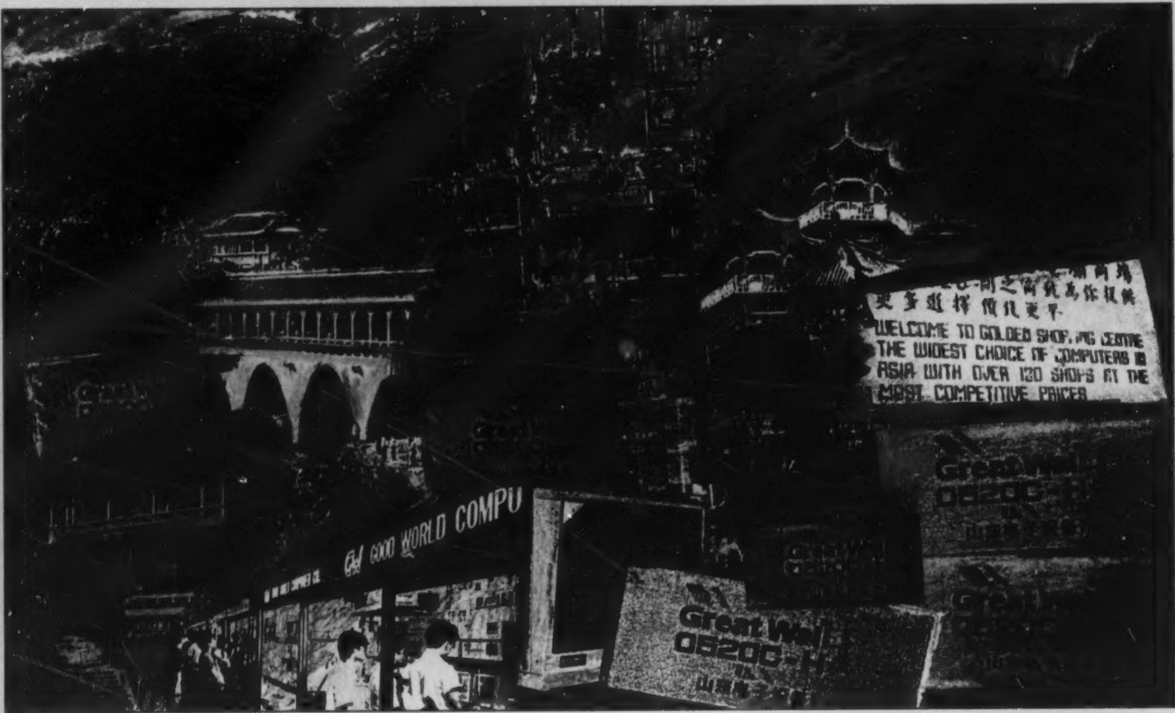

WELCOME TO GOLDEN SHOPPING CENTRE
THE WIDEST CHOICE OF COMPUTERS IN
ASIA WITH OVER 120 SHOPS AT THE
MOST COMPETITIVE PRICES
GOOD WORLD COMPU
Great Wall
0520C-H

Illustration by Jane Sterrett

Dateline Beijing: The China Syndrome

China has set out on perhaps its most important revolution—implementing computer technology in what is still a largely agrarian economy.

BY PAUL TATE AND
JOHN H. MAIER

During an exclusive interview with DATAMATION in Beijing, Prof. Hu Qiheng, the president of the Chinese Computer Federation, explained, "Closing the gap between China's hopes for using computers in the modernization of the economy, and what is really happening, is the task we are working on day and night" (see "Closing the Gap"). That's welcome news for the huge number of ambitious international companies attracted by China's wealth of natural resources, its market of 1.1 billion people, and its quickening move from Marxism to marketing.

Last year, those companies engaged in $50 billion worth of trade with China; that total is predicted to hit $75 billion by 1990. The growth in trade may rise even faster following the recommendations of a recent congressional Office of Technology Assessment report, *Technology Transfer to China*, and the imminent changes to U.S. laws concerning exports to China (see "A Brighter Shade of Green"). What eager companies don't find out until they start dealing with China, however, is that overestimating the business environment, and underestimating the Chinese people, can prove to be commercial suicide. "You can't simply implement the normal standard of corporate systems here, however much your business depends on it," points out Guenter Szwoch, manager of Siemens' communications and information systems group in the main China office. "For any commercial application, people's experience and thinking does not go beyond the level of the IBM PC."

Setting up operations in China is particularly difficult for the information systems departments of foreign companies. Trained computer personnel in China are few due to the country's lack of foreign funds to buy appropriate hardware and software. In addition, there is virtually no networking, the electric power supply is erratic, and, most important, the lack of applications knowledge precludes most efforts to create effective systems. It is that systems gap, more than almost any other element, that is helping to keep China's bureaucracies big, as well as limiting economic growth and hindering international trade.

Computers Key to Modernization Policy

The Chinese government, under the reforming leadership of Deng Xiaoping and premier Zhao Ziyang, is pushing ahead with its plan to modernize four key areas: industry, agriculture, the military, and science and technology. This plan was adopted as a national policy in 1978. Speaking at the Second International Conference on Computers and Applications, held in Beijing in late June, the head of the China State Council's Committee for Electronics Innovation, Li Xiang-Lin, told delegates that the country "regards computers as one of the key development objectives." The hope is that the use of computers can aid the transformation of the country from a largely agrarian and local craft-based society into a major world economic power in the twenty-first century.

Li Xiang-Lin estimates that by the end of 1986, China had an installed base of 8,000 minicomputers and mainframes, and over 200,000 micros. The number of LANs is still low, but it's growing rapidly. There are currently over 170,000 computer professionals in China, half of whom are involved in developing new applications. So far, Li estimates, systems have been developed covering 20,000 application program areas.

According to a 1986 report from the U.S. embassy in China, over 60% of the computers in China are used in transportation and industry, 17% in science and education, and only 3.4% in commerce and finance. The remainder is spread thinly in the cultural, health, and agricultural areas, as well as other sectors.

More significantly, the report suggests that one major reason for China's lack of widespread automation is gross underutilization of the systems the Chinese already have. "China could virtually double its computer processing by better training of its operators and the purchase and development of advanced software already available in the West," says the report. That may be underestimating the problem. Many people working in the information systems sector in China, including the Chinese, suggest that computers are being used at between only 15% and 25% of capacity.

The Role of Foreign Vendors

Much of the technology underlying those statistics has come from foreign firms—in the U.S., Japan, and Europe, (see "China's Computer Imports"). Over the last 10 years, China has imported an estimated $2 billion of foreign information technology. IBM, Digital Equipment Corp., Hewlett-Packard, Unisys, Fujitsu, Honeywell Bull, and Siemens have all had their share of those deals.

IBM regards its growing business in China with such seriousness that it set up an IBM China Corp. in Hong Kong in 1984. According to a statement from the IBM China office, "IBM's business in China is still very young. It is a very challenging environment, and we are still learning more about it every day."

Siemens is more forthright. "If you look at the world map and ask where are the areas of opportunity, then China is the biggest," says Szwoch. "Whether it will become a computerized society in 10 or 20 years I don't know, but if we're not here and it does, then we will have missed the boat."

One of the limiting factors to technology trade now is the shortage of foreign reserves available for foreign purchases. This is largely the result of overzealous expenditures during the first few years of the open door policy. A Chinese manager who was given a budget to im-

Closing the Gap

PROF. HU QIHENG

In an exclusive interview with DATAMATION in Beijing, Prof. Hu Qiheng, the president of the Chinese Computer Federation (CCF), detailed China's next moves.

Prof. Hu is among China's leading computer professionals. Born in 1934 and educated at the Moscow Chemical Mechanics College when China and the USSR were still close, she has worked on both process control and computer systems during her career. She now holds key positions within the Chinese scientific community. She is the founding president of the CCF, which was set up in 1985, and is also the deputy secretary general of the Chinese Academy of Sciences, the president of the Chinese Association of Automation, and a council member of the International Association of Pattern Recognition.

Her understanding of the underlying issues involved in China's computerization is clear. "The problem [of modernization] goes very deep into our culture," she explains. "It is a problem that results from the enormous size of our country and our organizational structure. This involves many unreasonable processes, and we must reform these processes. If we do not, then computerization will not be effective. You cannot just take the way we do things today and add a computer. That will not help. We must encourage political reform, then economic reform so that we can make the best use of computers."

She is also aware of the shortcomings in China's development of key application systems. "There are not many computers being used in the office and administration side of our country," she confirms. "This is the least effective area of application at the moment. In industry and science, computer use is much better."

The solution, she believes, is to "teach our people more about systems analysis, more about what computers can be used for."

The CCF takes an active role in this educational effort. It is made up of 24,000 members throughout China and is linked to local societies in 28 provinces. More important, it cuts across the traditional hierarchical structure of Chinese organizations. The CCF runs about 40 conferences a year, acts as a technical and high-level strategy consultancy for Chinese organizations, holds computer training courses for department heads in different industry sectors, and, through the use of the broadcast and publishing media, works to popularize computing with the Chinese people.

The efforts to expand computer use are limited by the scarcity of appropriate hardware and software in the country. Importing technologies to solve the problem isn't easy, however. "Money is in short supply for us, and we must establish a balance of trade with the West," says Prof. Hu.

She therefore believes that China must adopt a two-tier strategy for the future. "It is important that we buy systems and software that will help us to reform effectively," states Hu. "We must also be able to use our existing systems more effectively."

port Western technology would spend it on anything rather than give a cent of it back. They weren't prepared for the consequences.

"They were not aware of the enormous investment needed to get the right software and to implement a system," comments Siemens' Szwoch. "There's some magnificent equipment here that isn't being used. Millions of dollars of equipment. In the past, they got skinned, and they'll be more careful about what they buy in the future. They have learned the bitter lessons. Now they are overcareful. We have to regain their trust."

For a while, the Chinese thought that modernization meant having the right machines. Now they are learning that it is a systems game. China's guidelines for technology acquisition reflect the country's change of emphasis; systems must be above the level available in China, must be of practical use, must contribute to China's eventual self-sufficiency, must foster economic and social development, and must be useful for generating foreign exchange.

Not all of China's technology comes from abroad. It has its own computer traditions (see "The Long March") and is actively creating an internal computer industry, centered in Beijing and in Shanghai, much of it under the control of the newly formed China Computer Development Corp. (CCDC).

Set up in early 1987, the CCDC's stated aim is to become "China's IBM." It pulls together many of the disparate computer development and manufacturing facilities in China into one organization. The aim is to coordinate the country's production of machines and help ensure that the people with talent are given the right environment to work in. Cutting across the traditional hierarchies of Chinese state-controlled organizations is essential if this is going to be effective.

Thirteen factories that build the Great Wall microcomputer are part of the CCDC. Together, they produce 25,000 pcs a year. Factory Number 3, in Beijing, manufactured minis from 1965 until 1983, when it began producing 8-bit machines. Now it sells the IBM-compatible Great Wall, which it builds using Intel microprocessors and memory chips from Oki of Japan. It also makes a Motorola 68000 multiuser Unix system called the BCMS 68000. "What we would like to do is to make Digital's MicroVAX here," says Pan Tianbao, deputy chief of production at the plant.

FIGURE 1 China's Increasing Computer Imports*

(IN $ MILLIONS)

COUNTRY	1983	1984	1985	1986
France	5.8	1.6	2.8	9.2
West Germany	1.3	7.3	7.1	11.1
Italy	0.4	0.8	1.1	1.2
U.K.	2.3	4.0	6.0	4.3
Japan	25.7	49.9	83.7	84.9
U.S.	35.3	77.6	154.7	189.7
Total	70.8	141.2	255.4	300.4

*All figures include computer systems, cpus, and peripherals.

Source: Official Customs Statistics

The Long March

The first Chinese computer was completed in 1958, two years after the establishment of the Beijing Institute of Computer Technology (ICT) by the Chinese Academy of Sciences. The vacuum tube-based machine, called the Model 103, was not sophisticated, and was probably built with the help of Soviet technicians.

In 1960, the Soviet Union withdrew all of its technical aid from China. For the next two decades, computer development was solely in Chinese hands.

China's two second generation machines were announced in 1965. ICT developed a 32-bit computer called the Model 109B, while a much slower, 21-bit machine was produced by the Beijing Telecommunications Factory. Both of these were only laboratory models and never went into production.

In 1966, a massive blow to China's scientific development occurred—Mao's Cultural Revolution. While scientists in the West were building a computer industry, Chinese universities were shut down for almost 10 years. Scientists and the intelligentsia were forced to work in the fields and were hounded by the Red Guards.

Some development was protected, however, and IC-based machines built by researchers in Beijing and Shanghai began to emerge in the early '70s. However, China's various computer developers pursued extreme independence in those early years, producing 21-, 32-, 36-, 39-, 42-, 44-, and 48-bit architectures. These were mostly incompatible with international trends—and with each other.

More important, there was no successful, widespread penetration and diffusion of the technology into China's vast economy and society.

The turning point for China came in 1978 when a National Science Conference proclaimed that China's future modernization would be science driven and no longer ideology driven. Improvements in computing were identified as a high-priority national goal. China opened its doors to the West, and the result over the last 10 years has been substantial growth in Chinese computer development.

While China has imported more than 1,500 mainframes and minicomputers, and more than 150,000 micros since then, it is establishing its own industry. The Chinese, apart from setting up or expanding manufacturing plants to produce minis and micros, have also grappled with the problem of automating the ideographic Chinese language. In addition, they recently announced a 10MIPS array processor and a 100MIPS supercomputer called the Galaxy—or, translated literally, the River of Stars. The supercomputer project is a good example of the strategies and setbacks in Chinese computer development today. Though it is an ambitious system and was designed by the Chinese, it uses imported components. Reports in Beijing indicate that its performance is not very dependable.

Behind the News

SPECIAL REPORT

There are now an estimated 2,600 joint ventures between Chinese organizations and foreign firms. Though not all have been successful, many foreign computer firms are looking for a stake in one particular joint venture: to build a mainframe assembly plant in China. The chances are that the company that wins the deal will also win a massive share of China's growing mainframe market.

Naturally, IBM is interested. "We have been holding discussions regularly with the Chinese authorities on the possibility of cooperative projects," states an IBM China spokesman. Also in the running, according to local speculation, are China's other main suppliers: Unisys, Hitachi, Siemens, and perhaps Digital.

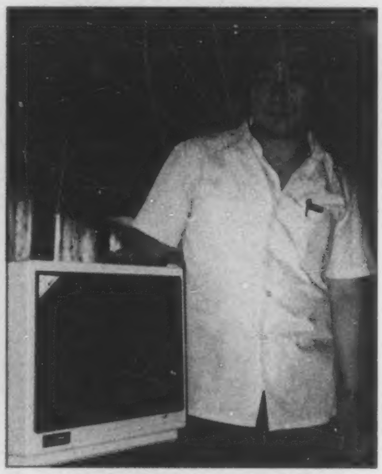
Installing the systems after they are made is another story. Jacques Witasse, corporate marketing manager for Honeywell Bull's new DPS 7000 range of systems, was running seminars in Beijing for Chinese users in June. He remarks, "There's nowhere in the world like this because they don't use computers the same way we do. Applications are almost exclusively scientific and numeric. When it comes to the automation of administrative tasks and offices, they don't do it. The networking side is also very difficult here because the communication system is so basic. I don't expect our machines to be used the same way here as anywhere else. They don't know what transaction processing is—and that's going to be the key."

The lack of networking hinders computer users in China in other ways. "Remote diagnostics simply isn't possible here," says Siemens' Szwoch. "Users have to wait until an engineer can get to them when there's a problem."

Improvements to China's networking ability are in the early stages (see "Networks to Come"). On the applications side, though, there already are examples of the way ahead for China.

In the buildings of the Municipal Government of Nanjing in the Jiang-su province is one of China's more sophisticated information systems. The main application is office automation and it supports Chinese character electronic mail, Chinese word processing, and a databased management information system. Twenty people can use the system at any time via terminals and a fiber-optic LAN.

One of the system's developers, Xue Xing, a PhD student at Nanjing University, explains that they had to start



Thirteen factories produce the Great Wall pc.

Networks to Come

China's computer networking plans, first announced in 1978, are now well behind schedule. Although there are an increasing number of local area networks in operation, very few computer users have ever come across wide area networking. The wide area links that do exist can be found either on the basic internal nets run by the rail, airline, and military sectors, or on the few leased-line connections from the offices of foreign companies to satellite earth stations.

All this is about to change, and the scientific community is taking the lead. China has made an official application to join Bitnet, the academic and research network that now includes over 200 member institutions in 17 countries. The plan is to make the first network broadcast from China on Oct. 1, 1987, and, by June 1988, to have linked 17 Chinese nodes via a prototype national research net called Chinanet. This will provide a long overdue practical example of national and international networking.

Setting it up, however, won't be easy. The main problem with networking in the country is the notoriously bad telecommunications system. Today, almost 10 years after China began its technological revolution, only one in 200 Chinese people have a telephone—one of the lowest telephone densities in the world. What's more, most networks are still unreliable, and getting a good line, even within some of the major cities, is fraught with delays, misrouting, and operator interventions.

Combine that with a lack of trained networking personnel and a scarcity of networking equipment, and it is obvious that China still has a long way to go.

There have been some improvements, however. China's telecom inventory now includes an expanding microwave network between 17 major cities; two Chinese communications satellites (successfully providing voice, data, and video service, according to the Chinese, though still experimental and with limited transponder capacity); several leased Intelsat transponders for domestic use, with a footprint covering all of China; a sparse national twisted wire infrastructure; and some special point-to-point links, including a coastal cable. In addition, China has installed 53 transmit/receive satellite earth stations and approximately 2,000 receive-only earth stations. China is also moving ahead with the use of fiber-optic technology, and that, combined with a satellite strategy, could eventually solve many of the country's network problems.

With demand for telecom services by Chinese and foreign companies now increasing rapidly (in mid-1986, there were 100,000 organizations waiting for communications links in the country, and that's only the beginning), China has become a suppliers' market for international telecom companies. For example, Belgium ITT, now merged into the new Alcatel group, has a $350 million joint venture in China to manufacture stored program control switches, while Japan's Fujitsu signed a $3.5 million deal in June with China's Fujian province to establish a joint software development center for digital switching systems.

Meanwhile, the Chinese network team, led by Prof. Qian Shixiang, chairman of the computer sciences department of the Beijing Institute of Aeronautics and Astronautics (BIAA), hopes to complete the initial Beijing branch of Chinanet this year using a local, dedicated fiber-optic network in the Haidan Qu district of the city. This will connect the BIAA, Beijing University, Qinghua University (China's equivalent of MIT), the Institute of Computing Technology of the Chinese Academy of Sciences, and perhaps other institutes in the area. During early 1988, this will be connected via 17 nodes across China to other universities and institutes.

from scratch. "There are not many systems using this type of application, but it is an area that is growing very fast," according to Xue. "The trouble is getting the money to develop and install them."

Access to more advanced software tools would help cut the cost of development, and that is the goal of China's national software engineering program. Run by Bosheng Zhan, associate professor and vice chairman of the computer science department of the Beijing Institute of Aeronautics and Astronautics, the program is sponsored by China's State Science and Technology Commission and involves researchers in 13 Chinese universities and institutes. The program's review committee, however, is not Chinese. It is made up of experts from the University of Maryland, College Park. The software engineering environment they are developing is based on Unix and written in C. "We think that some of our tools are better than anything in the U.S., and we would like to sell the ideas outside of China," says Bosheng.

A Base for Developing Applications

Complex software problems already have been overcome in China, particularly those connected with the major task of automating China's ideographic language—there are over 400 different Chinese character entry processing systems to choose from.

Now that the language has been automated with some degree of success, there is a base for developing administrative and office applications. Though the expertise needed to create effective systems is limited, this will change as the many Chinese students in the U.S., Europe, and other Asian countries—around 30,000 in 1986—return home after being exposed to Western management methods and techniques of systems analysis. Probably the most influence on the future of China's information systems development will come from foreign companies. They will set examples, make money, and, if they want to maintain and expand their systems in China, they will probably transfer some of their know-how to their trading partners.

Both the outside companies and the Chinese are becoming aware that they have to make realistic plans to account for limitations in the use of information systems as a base for business. China, meanwhile, is beginning to focus on closing its applications gap.

If international trade is supposed to be a process of mutual benefit, then trade with China will have to be a process of mutual education for a few years. "And then," as Prof. Hu puts it, "once the friendship has been established, the world will seem a smaller place." ■

Paul Tate is DATAMATION's international editor. John H. Maier is an independent computer and networking consultant in Fort Worth. He has been involved with Chinese computing for eight years and has recently spent a year lecturing in China on the computer sciences.

A Brighter Shade of Green

China has been off the export hit list since 1983, when it was transferred to country group "V" under the U.S. Export Administration Act. The green zone was added to the Commodity Control List that same year. The list determines what number of products can be sent to a country under what type of export license. The green zone demarcates items likely to be approved for export.

Among the green zone's original seven listings were semiconductor production equipment, computers, and computerized test equipment. The zone was expanded to 27 commodities in 1985 by the Coordinating Committee for Multilateral Export Controls (Cocom), which includes the NATO countries and Japan. Thus, technology within the new limits could be shipped to China at the exporting country's discretion, without preexport Cocom review.

Now, the green zone's grown again. The Department of Commerce's (DOC) latest guidelines expand to 285 from 155 the processing data rate (PDR, a measurement of computer performance) for machines sent to China. The guidelines, which had allowed disk drives to be exported disassembled, now allow assembled drives to be sent to China.

"I think Commerce finally recognized that U.S. companies need these kinds of guidelines to compete against the West European companies that have less stringent export controls," says Kelly Shea, a high-tech analyst at the National Council for U.S.-China Trade. The group of about 350 companies, including IBM, Digital Equipment Corp., Hewlett-Packard, and NCR, had recommended to Congress a further widening of the green zone to a PDR of 300.

According to the congressional Office of Technology Assessment's (OTA) report "Technology Transfer to China," 134 China applications valued at $145 million had been in the export pipeline for more than a year as of January 1987. While average processing for China cases had declined to 57 days in April, the processing time for referred China cases (those reviewed by agencies in addition to DOC) continues to take an average of almost six months.

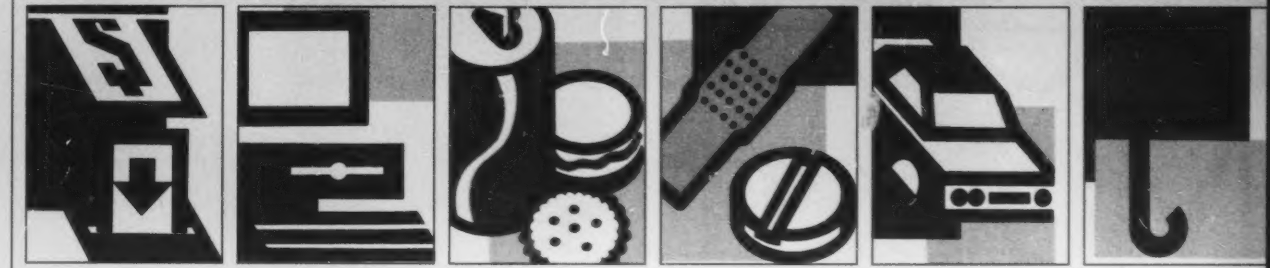
"OTA's research confirmed that other countries are generally able to reach a decision on even sophisticated dual-use exports in a few weeks," the report says, "while the U.S. frequently requires months or even years. In addition, only the U.S. unilaterally imposes controls on items not on the list of Cocom-controlled items, and requires that exports to allied countries, if reexported to third countries, be again subject to the original licensing. The latter requirement has caused considerable discord between the U.S. and other Cocom members."

According to OTA, computing equipment alone made up almost 80% of the value of 1986 export licenses approved to China. So while U.S. controls aren't the critical factor determining the overall volume of trade with China, they don't exactly help China get what it wants when it wants it.

Expanding the green zone is a start. But OTA suggests Congress not stop there. It recommends a six-day licensing policy for green zone cases; giving DOC the authority to approve licenses unless formally appealed to the President, with an automatic approval of cases that have been held up for too long; developing plans to enlarge the green zone; and ensuring that U.S. controls are in line with Cocom allies, even if that means dropping unilateral controls.

Should all this come to pass, it still doesn't guarantee a run on licenses by the computer industry. The desire to export "all depends on the company," says Jim LeMunyon, senior manager of government relations for the American Electronics Association. "And the new green zone combined with the OTA report should make it easier for U.S. companies to compete."

BY WILLIE SCHATZ



Industry by Industry IS Survey

The late senator from Illinois, Everett Dirksen, once said, "A billion here, a billion there, pretty soon it adds up to real money." We studied information systems spending at 120 of America's largest companies, industry by industry, and discovered that, indeed, we're talking real money, an average of just under 2% of total corporate revenues. Here's how IS is allocating its resources in a dozen industries.

A DATAMATION REPORT

The enterprises DATAMATION surveyed had an aggregate revenue of $1.5 trillion during the last fiscal year, which comes to something like a third of the U.S. gross national product. The total information systems expenditures made by these 120 giants of industry and commerce amounts to about 2% of their revenue as a whole. This works out to more than $27 billion, a sum that is in excess of the gross domestic product of New Zealand. Last year, about $9 billion of this was spent on hardware alone. A larger amount, $13 billion, was allocated to personnel expenses. Smaller portions of the total went for software ($2.5 billion) and overhead ($2.7 billion).

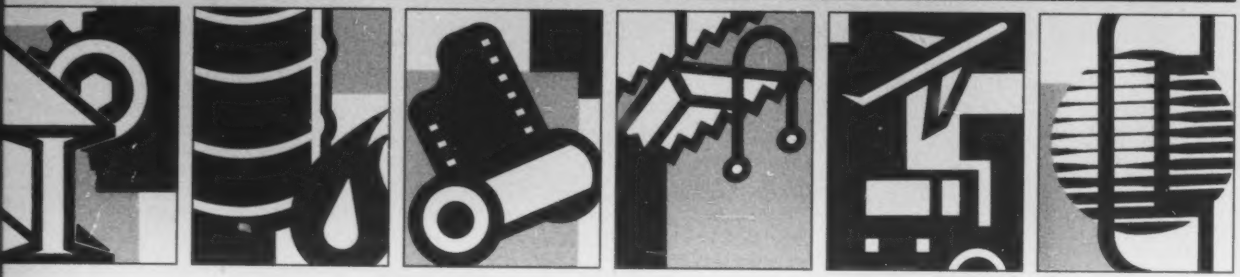
This year, IS budgets for individual companies will rise by anywhere from 3% to 20%, and total information systems expenditures will approach or surpass $30 billion. If the economy stays on track, the prospects for 1988 are even brighter.

Among fast-growing companies, the share of revenue going to information systems may decline this year compared with last, but many of the top computing executives indicate that their expenditures during 1987 are still subject to change. Because many of these users make significant hardware purchases late in the calendar year—as reflected in the revenue patterns of the computer industry's vendors—the actual totals for 1987 can't be known until the user organizations wind up this year's accounting work in the early spring.

Despite the enormity of these amounts, IS budgets substantially understate the actual computing expenditures within most companies. The chieftains of DATAMATION's top shops indicate that their companies spend considerable sums on computerization in addition to the specifically budgeted amounts. While the off-budget computing expenditures at some companies are insignificant, most information systems directors we queried estimate that their coworkers are independently spending sums equal to 5% to 50% of IS's budgeted total. In a few cases, information systems executives say that expenditures outside their corporate IS budgets may equal or exceed budgeted funds. For such companies—e.g., holding companies or certain franchisers—the corporate IS budget is really not a valid consolidated item, the way it is at a fiscally integrated enterprise.

The pattern of expenditures varies among the industry groups, as does the portion of corporate revenue that is allo-

Illustrations by Javier Romero



cated to IS departments. Companies that are mainly processors of information—banks, for instance—spend a greater share of income on computers than enterprises with huge plants and enormous raw material requirements, such as petrochemical outfits. Within the budgets of each group, the differences in the way funds are allocated—software versus personnel, or hardware versus software—reflect industry and corporate traditions. In some cases, the allocations are affected by what's available from hardware and software vendors.

Many users say they would prefer to use canned, standardized software, but they maintain that the packages on the market simply don't meet their requirements. These users spend money on personnel that might otherwise go to a software house with the right product. For some applications, the computer industry has made it cheaper to add MIPS than to add efficient programs. In other cases, such as applications where only special purpose number crunchers can do the job quickly, users have little choice but to go with exotic, and often costly, hardware. As a result, users with extensive algebraic workloads may spend more on hardware and less on software, compared with the national average.

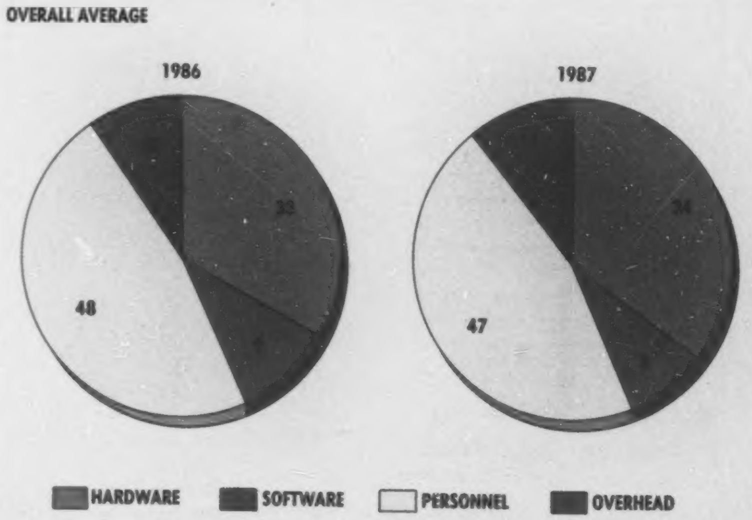
Despite all the difficulties faced by top shop managers as they try to cope with their dynamic departments, the results of this survey indicate that they are doing well. Common patterns within industry groups and even across group boundaries show that there are indeed norms. And despite the constant discussion among users about the perennial problems of computing, the leading IS executives generally report that they are satisfied with the results they are getting. More important, they indicate that their companies are also generally satisfied with the way their computing operations perform. ■

Industry by Industry Budget Summary

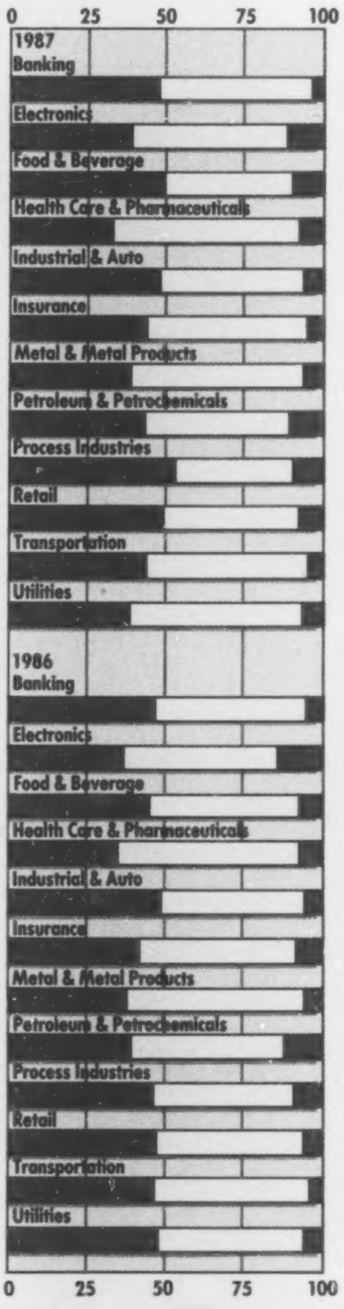
INDUSTRY	IS AS % OF REVENUE	IS BUDGET	REVENUE	PROFIT
Banking & Finance	4.5	$ 3,904.4	$ 86,968.2	$ 4,867.4
Electronics	3.7	4,839.8	131,274.4	8,121.4
Food & Beverage	1.6	1,657.1	104,334.3	6,282.8
Health Care & Pharmaceuticals	0.6	270.6	48,789.5	4,043.6
Industrial & Automotive	2.7	7,432.4	273,394.5	10,490.5
Insurance	1.7	1,678.5	100,115.5	5,182.4
Metal & Metal Products	1.1	495.0	45,083.3	–1,572.7
Petroleum & Petrochemicals	1.3	3,312.3	261,975.1	10,324.1
Process Industries	1.6	1,572.8	99,029.9	5,167.7
Retail	0.2	327.7	167,211.4	3,917.9
Transportation	1.3	712.7	54,994.5	89.5
Utilities	1.0	1,189.0	121,687.4	10,172.5
Totals	1.8	27,392.3	1,494,858.0	67,087.1

All dollar amounts are in millions.

Distribution of IS Funds by Percent



How They Spent



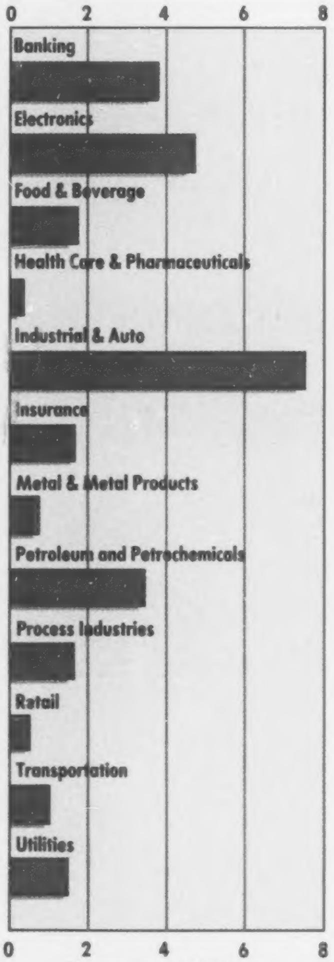
A comparison of the top shops' distribution of their budgets, by percent.

How to Read the Charts

Data in these graphs and tables reflect aggregate expenditures for the companies in each industry group. The data are presented in two ways. First, the groups are compared by aggregate information systems budgets and by average computing intensity. Computing intensity is the percentage of revenue devoted to budgeted IS (not including estimates of off-budget expenditures). Second, each sector's budget breakdown is presented in tabular and graphic form.

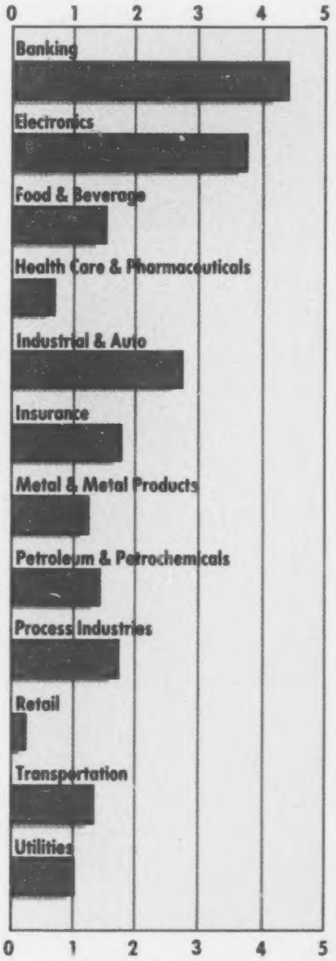
The table for each sector shows the companies in each group, their computing intensity, their size, their profits, and their accounting years. The computing intensity icon shows how each company in a group compares to others within that group. An equal sign (=) indicates that a company spends about the same percentage of its revenue on information systems as the mean for its group. A plus sign (+) means that a company spends a significantly larger proportion of its revenue on IS. A minus sign— means that a company spends a significantly smaller percentage of its revenue on information systems.

What They Paid



The aggregate IS budgets, in billions of dollars.

IS's Cut



The top shops' budgets as a percentage of their companies' revenues.

Money Is Information

Banks these days seem like giant computer systems. Automated teller machines (ATMs) take in deposits and dispense cash. Human tellers are often operators of complex workstations. Even less visible bank activities, like the management and trading of financial instruments, require computer technology. Little wonder, then, that banks proportionally spend more than twice the national average on information systems. Nonbanking financial companies, such as brokerage houses, similarly use high levels of automation to create and deliver their services.

In the banking and financial community, computer budgets are proportionally larger at the shops that provide a greater number of financial products to a large customer base. Banks that rely heavily on retail operations use more computing than their merchant banking counterparts.

In New York City, where Citicorp makes its headquarters, the megabank's ATMs seem as common as telephone booths. This huge bank is also a major provider of consumer credit services, a business that means processing mountains of paper. Its facilities range from an ATM around the corner from Manhattan's Dakota apartment building to an enormous charge card complex in Sioux Falls, South Dakota.

By contrast, J.P. Morgan, the bankers' bank, is a relatively light computer user, with far fewer customers but much larger typical transactions in its substantial business. If this institution's clients would let it round off after three digits, it might be able to manage its $7 billion books on a couple of pcs. But even Morgan's relatively lean annual IS budget is in the tens of millions.

A similar pattern of computing can be found among stockbrokers. Merrill Lynch is not only the largest company on Wall Street, but one of the most sophisticated when it comes to computing. The firm's retail side provides on-line services to thousands of sales personnel serving millions of investors. In addition, the computers for Merrill's retail operations must maintain the records and print the reports that clients and government agencies require.

There is also an institutional side to Merrill. At the firm's Capital Markets operation, giant mainframes running APL are used for programmed trading applications developed by so-called rocket scientists, in much the same way as humble pcs are pounded by Lotus-loving bean counters.

By contrast, Salomon Brothers' clientele is primarily institutional. Because Salomon does not have to provide computer support for a myriad of individual investors, as does Merrill, its computing budget is perceptibly smaller.

Far less computer intensive is Fannie Mae, the Federal National Mortgage Association, which deals with one genre of financial instrument and does not have to link its executives with the world's markets in stocks, bonds, commodities, and currencies.

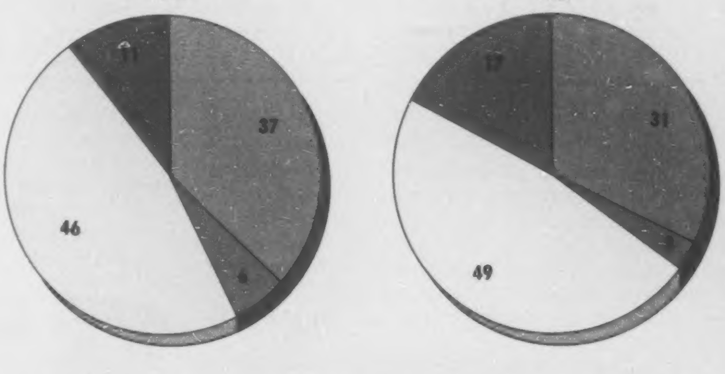
The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
American Express Co.	=	14,652	1,110	Dec. 31
Federal National Mortgage Assn.	–	10,540	183	Dec. 31
Citicorp	+	10,400	1,058	Dec. 31
BankAmerica Corp.	=	10,131	- 518	Dec. 31
Merrill Lynch & Co. Inc.	+	9,606	469	Dec. 31
Manufacturers Hanover Corp.	=	7,965	411	Dec. 31
Salomon Brothers Inc.	–	6,789	516	Dec. 31
J.P. Morgan & Co. Inc.	–	6,672	873	Dec. 31
First Interstate Bancorp.	=	5,290	338	Dec. 31
Bankers Trust New York Corp.	+	4,923	428	Dec. 31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.

Distribution of IS Funds by Percent

Banking and finance are the most IS-intensive sectors of U.S. business, with average information systems spending using about 4.5% of revenues.



The Vendor Is a Consumer

The electronics business not only dishes out computers—it takes them, too. With an aggregate information systems budget of nearly $5 billion during the most recent fiscal year, the leading companies in this sector have put their own products to wide use. The electronics industry is one that is continually developing new applications and customizing existing ones. So it is no wonder that, compared with the national average of top IS operations, this sector has lower software costs and higher personnel costs, due to the man-hours required for applications development. The proprietary circuit design and simulation programs that characterize this business may also account for some of the differences from the national norms displayed by this sector. Other factors that affect IS budgets are the relatively high salaries and expensive facilities that are typical of high-tech manufacturers.

Executives at the top companies in electronics say there can be wide fluctuations in their IS budgets from year to year. Their shops grow in spurts as whole new systems are brought up to handle new applications. In addition, as engineering departments' computers are linked into enterprisewide networks that can store databases, the budgets of IS directors will grow, while off-budget expenditures will be pared down.

The biggest spender in the group—proportionally, as well as in terms of total expenditures—is also the biggest company, IBM. Increasingly, IBM has added databases and interactive facilities to support its marketing, planning, and service groups. As the number of installed IBM products has burgeoned with the workstation market, the company's record-keeping burden has increased substantially. In addition, IBM has pushed out the frontiers of its business by ramping up semiconductor production, adding numerous software products, and accelerating the pace at which it produces, catalogs, and distributes information within its empire. IBM's top executives have stated that they are increasing their ability to monitor and control costs, and that of course means more and more information systems.

A much smaller portion of revenue goes to information systems in companies like Control Data Corp., which is far from a pure electronics producer. Many of CDC's diverse operations resemble those of other nonelectronic manufacturers. Unlike IBM, which obtains the majority of its income from direct sales, CDC gets a very large chunk of its revenue from goods that are sold in large lots to distributors. CDC also receives substantial revenue from the services sector. Nevertheless, Control Data, like all the companies in this sector, is a big computer user by national standards; its classification as a low-intensity shop really reflects its place among a group of technologically sophisticated users. Between CDC and IBM lies Intel, not only the supplier of cpus for a majority of the world's microcomputers, but a substantial computer user in its own right.

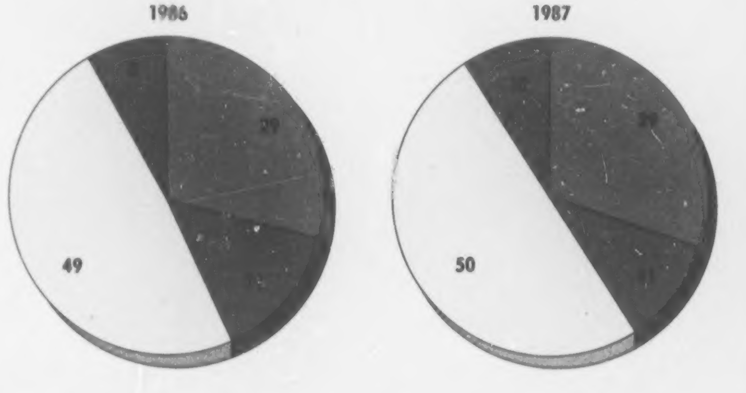
The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
IBM	+	51,250	4,789	Dec. 31
General Electric Co.	=	36,725	2,492	Dec. 31
Xerox Corp.	–	9,781	487	Dec. 31
Digital Equipment Corp.	=	7,590	617	June 28
Unisys Corp.	=	7,433	–43	Dec. 31
Hewlett-Packard Co.	=	7,102	516	Oct. 31
Honeywell Inc.	=	5,378	–398	Dec. 31
Control Data Corp.	–	3,347	–265	Dec. 31
Square D Co.	–	1,403	99	Dec. 31
Intel Corp.	=	1,265	–73	Dec. 26

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.

Distribution of IS Funds by Percent

While the electronics sector comes in second in average percent of revenues devoted to IS, one company spends more than 6.6% of revenues on IS.



FOOD & BEVERAGE

Bread and Butter Users

Somewhat below the national norms for information systems intensity set by the top IS shops, food and beverage companies are more conventional users of computers, with annual expenditures of $1.7 billion. In addition to bread-and-butter applications, America's largest purveyors of edibles and quaffables use computers to analyze the sales patterns of their myriad brands, sometimes on a daily basis. They manage complex inventory problems, often involving perishable products. Many also provide inventory support and advice to their distributors and largest retailers, although they lag behind the leading pharmaceuticals suppliers in this emerging application.

While these companies expect some expansion of their computing requirements as they bring in new applications aimed at streamlining the exchange of information and increasing inventory turnover, much of the need for additional computing will come about as a by-product of normal business growth. The largest companies in this group are also involved in nonfood businesses; this affects the size and nature of their computing departments.

Philip Morris Inc. is more than half again as large as its nearest competitor in the field, Nabisco Brands Inc. Nabisco is half again as large as the number three company, PepsiCo Inc. PepsiCo, however, is the most intensive computer user in the group. This may be due to the company's financial orientation. In the past, PepsiCo has been deeply involved in leasing and related endeavors, and the company still has a whole division to manage pension funds. At the low end of this group's computer intensity scale is American Brands Inc. But today's low-intensity user may be a big player tomorrow, for food and beverage companies have exhibited big appetites for new acquisitions. The practice at these companies of buying and selling whole businesses shapes the role of their star computer jocks.

When food and beverage companies diversify, their computing requirements are inevitably shaped by the enterprises they acquire. These days, tobacco barons own insurers, soda pop's pashas control fast-food chains, cereal kings sell tires. It is clear that the more diverse these companies become, the more they will depend on information technology to compare the apples and oranges they sell and the more they will resemble the average large user.

Companies in this sector currently spend a relatively larger percentage of their budgets on software than the national average and a smaller amount of money on homegrown applications. These firms' proclivity for canned software, says one MIS executive, is a result of the frequency with which they buy and sell business units. Standardized inventory and financial software makes it easier to integrate a new subsidiary into the fold or, for that matter, to present its financial statements to a prospective buyer.

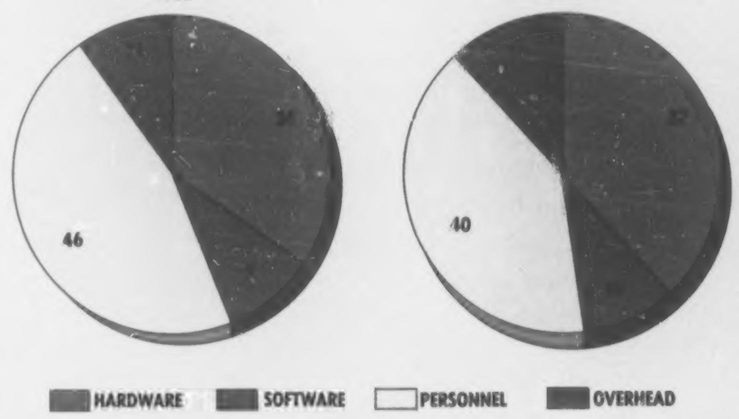
The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Philip Morris Cos. Inc.	=	25,409	1,478	Dec. 31
RJR Nabisco Inc.	=	15,978	1,080	Dec. 31
PepsiCo Inc.	+	9,291	458	Dec. 28
Kraft Inc.	=	8,742	413	Dec. 27
Coca-Cola Co.	=	8,669	934	Dec. 31
American Brands Inc.	–	8,470	847	Dec. 31
Sara Lee Corp.	=	8,340	241	June 30
Anheuser-Busch Companies Inc.	=	7,677	518	Dec. 31
ConAgra Inc.	=	5,911	105	May 25
Pillsbury Co.	=	5,848	208	May 31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.

Distribution of IS Funds by Percent

A big piece of the food and beverage sector's software dollars go for packaged software, not homegrown applications.



HEALTH CARE & PHARMACEUTICALS

Tracking Vital Statistics

The MIS department has taken on new importance for this industry. To assist their customers and to foster loyalty, pharmaceutical makers have begun to provide inventory management services, putting terminals in drug stores and sending computer instructors out to visit pharmacists. For health care providers, record keeping assists in caring for patients and in the complex area of billing and government regulation.

Despite the importance of information processing technology in crucial aspects of this industry's daily work, the overall use of computers is relatively light. So large a part of these companies' budgets goes into research (in the case of the pharmaceuticals sector) and medical facilities operations (in the case of health care providers) that information systems costs are overshadowed. As a result, the reported expenditures on computers made by these companies are not necessarily a valid indicator of the overall importance of automation to their proper functioning.

In this sector, computers also figure in off-budget expenditures that are not easily fit into the mainstream. Computer systems help control the production, testing, and packaging of medicines; they also monitor in real time the vital signs of critically ill patients and assist technicians in the analysis of biological samples. Such applications of computer technology are not typical corporate IS.

Compared with other items in their budgets, and to the national average for personnel expenditures, pharmaceutical companies experience personnel costs that are particularly large. There are two apparent reasons for this variation. One is that the applications programs these organizations need are not always available off the shelf, even though they may be built around a core of standard database software. The stringent requirements for data integrity, audit trails, and security exceed similar requirements in other sectors, for this is an industry that not only may be subject to economic sanctions in the wake of a mishap, but legal sanctions as well.

A second source of this sector's unique budgeting pattern is the popularity of minicomputers in both pharmaceutical companies and health care facilities. In addition to the costs associated with the programming and operation of standalone minis, IS managers in this sector must also deal with the difficulties of interconnection.

A typical company in this group is McKesson Corp., San Francisco, whose computing patterns follow the trends in the industry, with one exception: the company's effort to speed applications development is reflected in an even more intense bias toward personnel and away from canned software. By contrast, health care provider National Medical Enterprises Inc., Los Angeles, spends a considerably larger portion of its budget on commercial software packages; industry-provided software is apparently easier to adapt to this company's recordkeeping needs.

The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Johnson & Johnson	+	7,003	330	Dec. 29
McKesson Corp.	=	6,285	215	Mar. 31
Baxter Travenol Laboratories Inc.	=	5,543	444	Dec. 31
Hospital Corp. of America	=	4,931	175	Dec. 31
American Home Products Corp.	+	4,927	779	Dec. 31
Bristol-Meyers Co.	=	4,836	590	Dec. 31
Pfizer Inc.	=	4,476	660	Dec. 31
Merck & Co. Inc.	=	4,129	676	Dec. 31
National Medical Enterprises Inc.	=	3,595	118	May 31
Bergen Brunswig Corp.	=	3,066	58	Aug. 31

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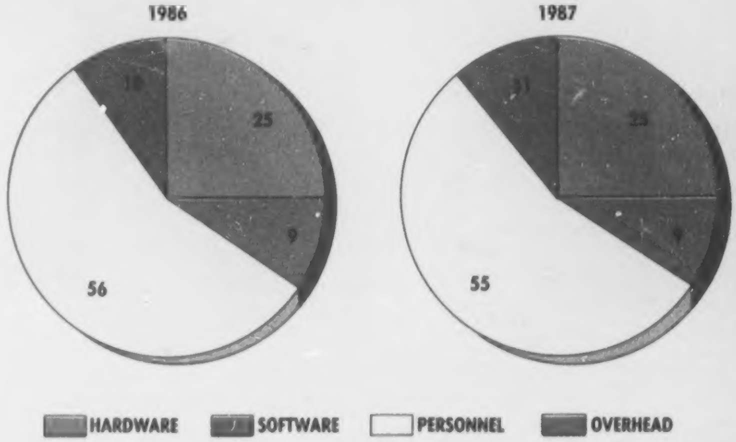
Distribution of IS Funds by Percent

This sector spends a lot of its IS money on personnel, much of it due to custom-made applications programming.



MIS in the Machine Age

The industrial and automotive sector is the most substantial group in this survey, both in terms of aggregate revenue and total IS expenditures. The combined sales for these companies in the last fiscal year were nearly $275 billion, while IS expenditures were nearly $7.5 billion. It's no wonder the computer industry caters to automakers and their industrial cousins.

Hardware purchases come to more than 40% of computing budgets for the heavy industry companies, $3 billion in round numbers. Software represents a slimmer slice of the pie than it does in the overall average, but nevertheless exceeds $500 million a year in purchases.

The vast sums spent by these companies today may look like small potatoes tomorrow as the big three automakers tie their dealers to central computing systems. Even though the dealership minicomputers will be paid for by the independent outlets that sell cars and trucks, the auto manufacturers will become larger and larger service bureaus for their clients, burning up MIPS like tires in a road race.

A big contributor to the heavy iron budgets in this sector is the increasing use of computers to anticipate manufacturing problems and reduce costs. Materials and production time saved during the design phase of a car can return phenomenal dividends when the model is released for production. Similarly, makers of aircraft and other heavy machinery have adopted automated design, simulation, and, to a lesser extent, fabrication technologies in an effort to improve quality and control costs. All these applications require huge algebraic processors, and in some cases have led to the purchase of supercomputers. These companies are also buying vector processing add-ons for their general purpose mainframes to offload work from design departments' overloaded superminis.

General Motors is the biggest user in this sector, with its huge divisional information systems centers at auto plants, its EDS subsidiary—itself one of the computer industry's biggest customers—and its Hughes Aircraft division. But GM is not necessarily the most computer-intensive company in the group. McDonnell Douglas Corp., said to run the largest privately owned computation center in the world, is also a contender.

MIS managers in this sector face unusual challenges because of the sheer size of the operations they supervise. They cannot always look elsewhere for examples of how to handle their heavy workloads, but instead must use their own initiative and break new ground. General Motors, for instance, is still struggling with the issues raised by its proposal for the MAP standard. By all indications, GM cannot realistically expect to link its diverse production systems with central computation facilities in the near future. This temporary setback has not reduced GM's clout: the company is said to have exerted substantial influence over IBM during the evolution of that company's engineering workstations.

The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
General Motors Corp.	=	102,814	2,945	Dec. 31
Ford Motor Co.	–	62,715	3,285	Dec. 31
Chrysler Corp.	–	22,586	1,404	Dec. 31
Boeing Co.	=	16,341	665	Dec. 31
United Technologies Corp.	=	15,879	73	Dec. 31
McDonnell Douglas Corp.	=	12,661	278	Dec. 31
Rockwell International Corp.	=	12,296	611	Sept. 30
Allied-Signal Inc.	=	11,794	605	Sept. 30
Lockheed Corp.	=	10,273	408	Dec. 28
TRW Inc.	=	6,036	218	Dec. 31

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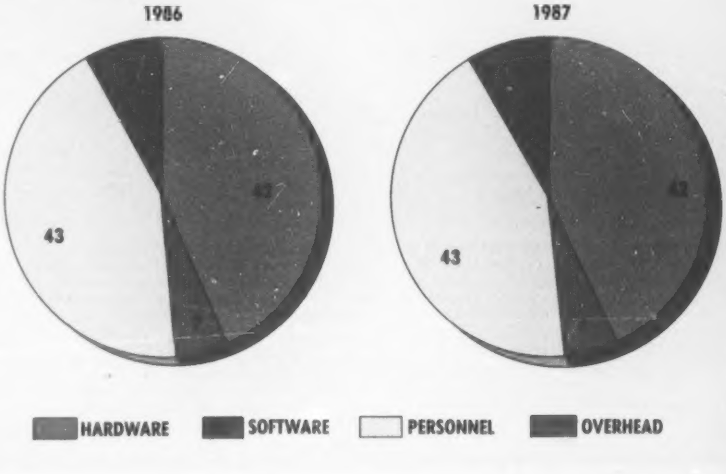
Distribution of IS Funds by Percent



The hardware sector of American business is the biggest consumer of computer hardware, both in dollars and in percent of IS budget.

INSURANCE

A Premium on Information

The insurance industry puts a premium on computers. The 10 largest companies in this sector together spend $1.7 billion of their more than $100 billion in revenue on IS. Their spending pattern is close to the national average in every category. The insurance industry's leaders invest more than half a billion dollars a year in hardware and more than $150 million in software. In addition to their official budgets, insurers spend another 30% of allocated amounts for off-budget information systems. This puts them near or slightly above the national mean.

Because insurers' budgets seem to follow the national averages in certain areas, it is natural to assume that these large and wealthy companies are generally conservative about computing. Nothing could be farther from the truth. Insurers, with their enormous IS requirements—to say nothing of their desire to make the most of clients' premiums—have figured prominently in pioneering the application of computers to commercial accounting.

Two decades ago, when IBM's first 360 systems were under test at the headquarters of New York Life (a company not quite big enough to make our roster), just one floor below, an RCA Bizmac—a vacuum tube computer—was churning out production jobs. Insurers, then, not only got into computing early, but they have continued to use the know-how they developed over the years. These days, as the big central shops of the industry run gigabyte-sized sorts, their companies' sales forces visit corporate clients with laptop computers.

The largest of the insurers, Aetna, appears to be relatively light on technology compared with its peers, while ITT Corp. is more computer intensive. ITT's standing is owed more to its noninsurance divisions, which resemble other industrial manufacturing companies. But Aetna's situation is harder to interpret, and it may be evidence that the company uses computers somewhat differently from its smaller competitors. Aetna's spending on information systems is still substantial by any standards. Other large insurers, which are somewhat more computer intensive, spend even more on budgeted computing. More typical of the group are Cigna Corp. in Philadelphia and Travelers Corp. in Hartford, Conn., which are heavier on computing than Aetna, in part because they are making strong efforts to put automation behind their productivity plans.

One area in which computers are of growing importance to insurers is in their regional business centers, where the trend is toward installing minis. There is a substantial payoff for insurers if they can implement flexible, responsive systems. Insurers' clients are very service conscious, and the large ones expect policies to be instantly tailored to their changing requirements.

Additionally, the velocity at which funds flow into insurers' bank accounts can make a big difference in profitability. Premium processing bottlenecks impose severe penalties on these companies.

The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Aetna Life & Casualty Co.	–	20,483	1,043	Dec. 31
Cigna Corp.	=	17,064	817	Dec. 31
Travelers Corp.	=	16,047	444	Dec. 31
American International Group Inc.	=	8,876	657	Dec. 31
Loews Corp.	=	8,626	546	Dec. 31
ITT Corp.	+	7,600	494	Dec. 31
American General Corp.	=	6,160	538	Dec. 31
Transamerica Insurance Co.	=	6,076	268	Dec. 31
Continental Corp.	=	6,002	223	Dec. 31
St. Paul Cos. Inc.	=	3,182	154	Dec. 31

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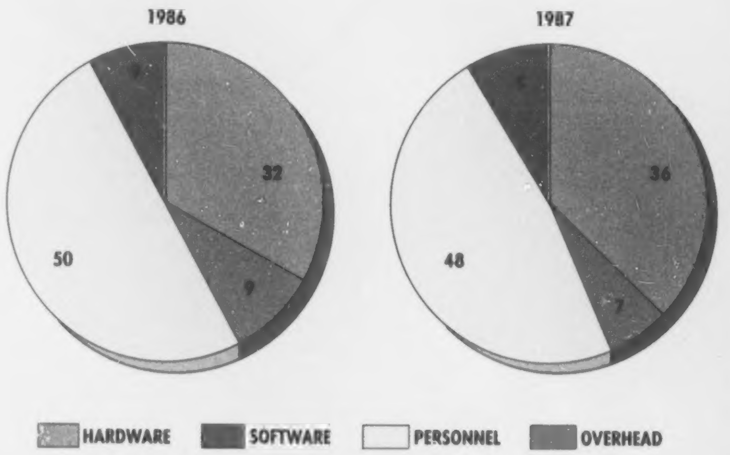
Distribution of IS Funds by Percent

The insurance industry leaders invest more than half a billion dollars a year in computer hardware.



Heavy Metal, Light Users

Companies that produce heavy metal goods are much lighter IS users than other industrial companies. Because of the sector's declining health over the past several years, the group's computing needs have not grown along with those of other top shops. But the metals business is still a very big one, and its 10 largest participants pump about $500 million a year of their more than $45 billion in revenue into information systems. As the companies in this group iron out their problems, diversifying operations and selling off unneeded assets, IS managers say their computing facilities will grow anew.

This group's big users spend less of their budgets on hardware and more on personnel than the national average. The contrast is even greater when these companies are compared to other industrial organizations. IS budgets in the metals trade, however, do not encompass the computer-based systems employed to control smelting processes, annealing furnaces, and rolling mills. Ironically, some of the personnel involved with these off-budget systems may well be on the staffing line included in the IS manager's list of expenditures. The actual practices, however, vary from company to company within the industry.

Another factor that makes for significant reported variance (in both budgets and the allocations within them) is the recent trend toward diversification. This change is evident at, and reflected in the new name of, the industry's largest company, USX. USX is a big player in the oil business, running Marathon among other units. It also operates chemical companies and even runs a sizable shipping business used to ferry raw materials across the Great Lakes. None of its nonsteel interests, however, are computer intensive. Bethlehem Corp. is one of the most IS-intensive companies in the group, but differs in corporate IS philosophy from its colleagues. "Bessie," as the big steel company is called, is a heavy buyer and developer of software, compared with the group's mean, while Alcoa, more typical of the metals companies, has a relatively larger hardware budget.

Off-budget expenses vary quite a bit across this industry sector. Armco, characteristic of its group in many respects, has been particularly successful at controlling off-budget IS expenditures. Bethlehem Steel, a more intense user of computing than Armco, has even more stringent control of off-budget computer spending. Bessie has gotten unbudgeted computing costs down to a bare minimum, keeping such expenditures flat from 1986 to 1987.

Among the metals group's most important applications is inventory management. With supply lines stretching around the globe and facilities that must run evenly in order to remain efficient, the metals companies need planning and control. The best efforts of their MIS departments, however, cannot always offset the vicissitudes of the world's metals markets.

The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
USX Corp.	–	14,938	1,833	Dec. 31
LTV Corp.	=	7,271	–3,252	Dec. 31
Aluminum Company of America	=	4,667	264	Dec. 31
Bethlehem Steel Corp.	+	4,333	–153	Dec. 31
Reynolds Metals Co.	=	3,639	192	Dec. 31
Inland Steel Industries Inc.	=	3,173	19	Dec. 31
Armco Inc.	=	2,641	–472	Dec. 31
Kaiser Aluminum & Chemical Corp.	=	2,222	–33	Dec. 31
AMAX Inc.	+	1,307	14	Dec. 31
Commercial Metals Co.	–	893	14	Dec. 31

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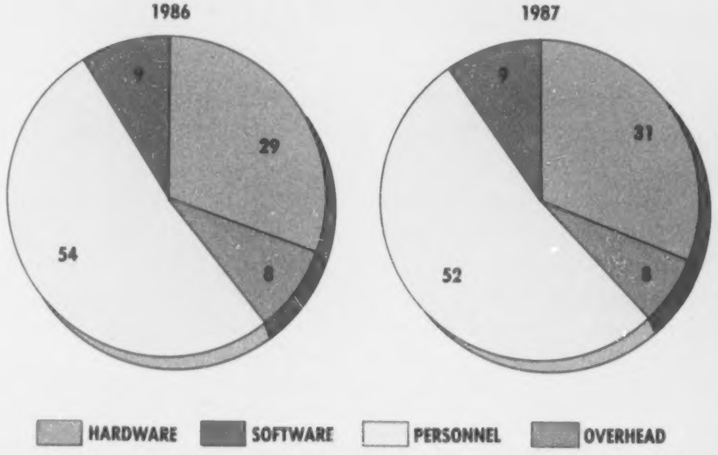
Distribution of IS Funds by Percent

One of the metals group's most important applications is inventory management.



Oil Fields, DASD Farms

All may not be well in the oil patch, but life is good enough among its largest 10 companies to justify well over $3 billion a year in information systems expenditures. Because other costs remain so high, the petroleum industry devotes proportionately less than other industries to the computing budget. Leaders in this sector divide their IS monies in proportions that are close to the national mean. The IS shops in these companies say they spend a little less on hardware and a little more on overhead than their counterparts in other sectors.

One budget item is larger than in most other nongovernmental areas: storage of data in vast archives. Many of the oil producers have invested heavily in seismic data collection and analysis. They are big warehousers of magnetic tape. At some of these companies, the seismic image processing jobs are so enormous that supercomputers have been brought in to handle the mathematical transformation of raw exploration data. Others in the industry, however, send this work out to service bureaus.

Another application honed to a fine edge by these companies (as it has been by the process industries) is linear programming. Getting the right mix of octane, kerosene, and bunker (a heavy residual oil) from the refinery is a job that cannot be done without computers.

Other optimization programs are used to help manage the movement of raw and finished products flowing through networks of pipelines and carried by fleets of tankers. The oil companies also use computers or outside computer service bureaus to perform a key function that involves large numbers of equations: econometric analysis and forecasting. It is the financial planning done with the aid of computers that sets the pace of exploration, well drilling, and long-term oil contracts.

The largest companies in this group are also relatively light users of computing power, but Exxon and Mobil have such vast empires that their information systems expenses may simply be diluted in a pool of other costs. Nevertheless, there are significant similarities in the budget breakdowns of all the petroleum companies in terms of hardware and software purchases. One area that can increase the hardware budget of a petroleum company is a credit card operation, though this is the case at only a few of the companies in this group. Amoco is more representative of computer users in the oil business, and differs from the group norms only in minor ways: its software and services budget runs on higher octane, compared with its rivals, while its hardware allocation runs a little leaner.

The major participants have a healthy appetite for mainframes, and they seem to have good control over off-budget expenses, which are less than the national norm. The apparent efficiency of oil companies' computing shops may be a by-product of their corporate cultures. Business procedures in oil companies have a tradition of near military precision in their organizational scheme.

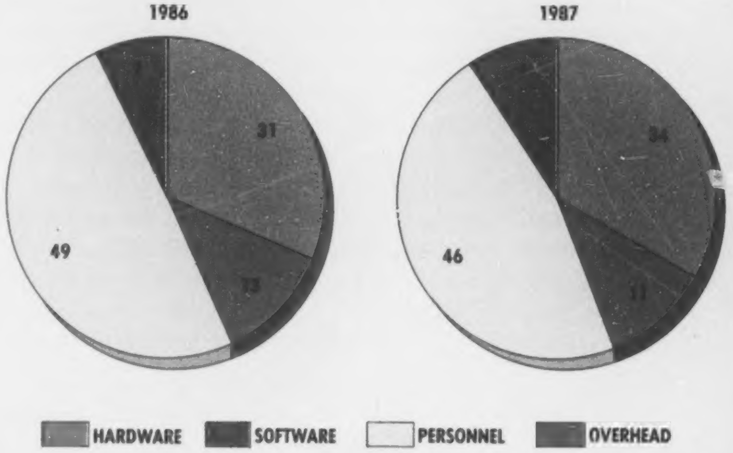
The Top 10

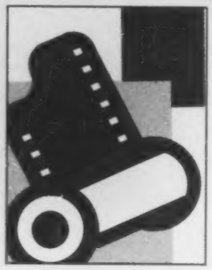
COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Exxon Corp.	–	71,557	5,360	Dec. 31
Mobil Corp.	–	49,865	1,407	Dec. 31
Texaco Inc.	=	32,600	725	Dec. 31
Chevron Corp.	=	24,351	715	Dec. 31
Amoco Corp.	=	18,281	747	Dec. 31
Occidental Petroleum Corp.	=	15,344	181	Dec. 31
Atlantic Richfield Corp.	=	14,993	615	Dec. 31
Tenneco Inc.	=	14,529	–39	Dec. 31
Sun Company Inc.	=	10,440	385	Dec. 31
Phillips Petroleum Co.	=	10,015	228	Dec. 31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.

Distribution of IS Funds by Percent

A big expense for oil patch IS operations is data storage, raising overhead's bite of this sector's IS dollar.





PROCESS INDUSTRIES

Continuous Computing

Computing in the process industries evokes images of real-time control centers with Christmas tree-like displays of indicator lights and color graphics. As accurate as this picture may be, those systems represent only a fraction of the computing costs at the largest providers of chemicals, paper, and other continuous production goods.

Corporate computing in this sector is a big business in itself. Aggregate expenditures by the 10 largest revenue gainers is in excess of $1.5 billion. These leading process companies are putting big muscle behind efforts to consolidate data from scattered plants. The result is likely to be significant growth in both raw MIPS and the number of networks among these companies, as well as the consolidation of many off-budget systems under central management.

Process companies are big purchasers of standard software and specialty packages developed by third parties, every year either acquiring outright or licensing program products worth about $200 million. These companies spend, as a result, less of their budgets on homegrown programming. Like their peers in the petroleum business, process industry IS managers have to support extensive libraries of process optimization programs and databases, which are the feedstocks for these packages.

In addition to all the computing required to make the most of their facilities, process companies must keep track of an enormous variety of raw materials and end products. Companies such as Du Pont and Procter & Gamble—also the largest entities in this sector—deal in thousands of different products in hundreds of classifications, with differing packaging, stability, distribution mechanisms, and production constraints.

Many of the process companies are involved in consumer products, though none as completely as Procter & Gamble. Consumer products involve enormous advertising expenditures, but generate profits that more than compensate. The result is that a smaller percentage of the budget goes to production and management functions, including information systems. It is not surprising, then, that P&G is not as big a spender, proportionately, on computers as is, for example, Kodak or Monsanto. (Weyerhaeuser's IS intensity rating may be slighty misleading as the company is well known for conducting a substantial part of its computing at the divisional level.)

As this sector increasingly shifts to on-line order entry and customer support and delivers these services to regional offices and key outside distributors, MIS budgets will rise. The evolution of their IS capabilities will enable the companies in this group to turn over inventories more frequently and to reduce what for some of them amounts to a king's ransom in storage costs. Those companies with experience in real-time process control are likely to have the easiest time coping with the communications aspects of improving their order-shipping-billing cycles.

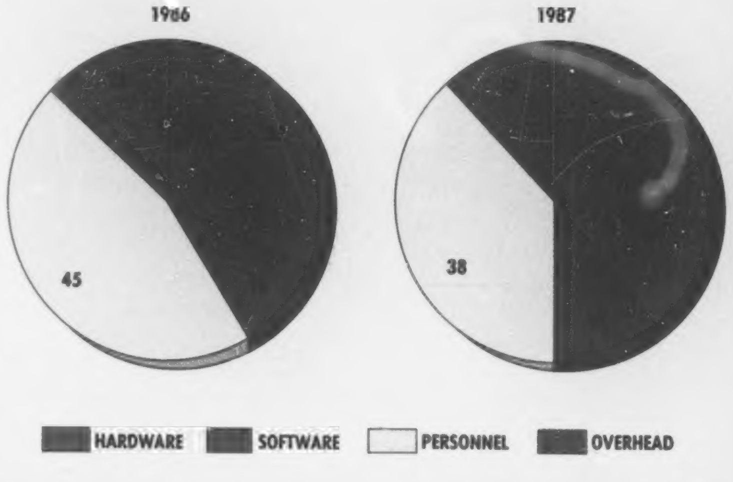
The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Du Pont	=	27,148	1,538	Dec. 31
Procter & Gamble Co.	–	15,566	709	June 30
Eastman Kodak Co.	=	11,550	374	Dec. 31
Dow Chemical Co.	=	11,113	741	Dec. 31
Georgia-Pacific Corp.	–	7,223	296	Dec. 31
Monsanto Co.	=	6,879	433	Dec. 31
Union Carbide Corp.	=	6,343	496	Dec. 31
Weyerhaeuser Co.	–	5,652	277	Dec. 28
American Cyanamid Co.	=	3,816	203	Dec. 31
Boise Cascade Corp.	=	3,740	102	Dec. 31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.

Distribution of IS Funds by Percent

Aggregate IS expenditures by the 10 largest revenue gainers is in excess of $1.5 billion.



RETAIL

The World in the Store

By the measure of information systems intensity used by DATAMATION to gauge companies' computer use, retailers are barely in the computer age. The nation's 10 largest retailers, with total sales of over $167 billion, may spend a small fraction of this sum on computers, but their IS budgets come to nearly $350 million a year, with more than $125 million of it going for hardware and another $30 million for software.

In addition, several of the large retailers have significant off-budget expenses for computing, sums that may rival budgeted amounts in magnitude. This is because of the way retailers are organized and, in particular, the way they delegate information processing responsibilities. Not one of the companies in this group could manage the logistical aspects of its enterprise without substantial and sophisticated IS shops. These companies can track every penny of a small sale starting at the cash register and following through to the corporate asset management group that maximizes the return on assets. But much of the computing done at chain stores—whether food or nonfood—is done at the individual site or at the regional level. Corporate IS's big jobs are consolidation and the provision of industrywide services, such as customer account management.

The department store chains in this group, like JC Penney, Federated Department Stores Inc., and Dayton-Hudson Corp., usually spend more of their revenue on computing than the supermarket operators, such as Lucky Stores Inc. While K Mart Corp., a department store chain, falls in the midrange when it comes to IS budgets, its philosophy of getting the attention of shoppers apparently was picked up by its own computer professionals, who are adding hardware at a pace more typical of the sector's intensive users.

Department stores, which have a lower rate of inventory turnover than supermarkets, generally provide their customers with more computer-supported services. In addition to credit card processing, the department store chains support telephone ordering services and mail order processing. They also require more information systems for personnel and payroll functions, while supermarkets cater to self-service shoppers.

All of these services, with the associated record-keeping, force retailers to put a larger part of their MIS budgets into hardware than the national average. In addition, the increasingly sophisticated communications links, which enable chain stores to consolidate earnings and inventory information, add to the budgets for iron. Managers of the largest computing operations in the retail sector say that their software budgets—currently below the national average—will rise considerably, although not quite enough to catch up with the mean. This change reflects a move to the use of more standardized packages, a requirement of companies that enter new businesses via acquisitions.

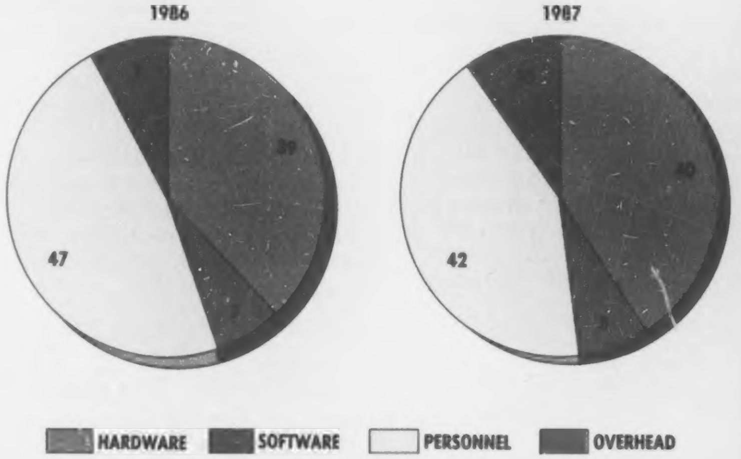
The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Supermarkets General Corp.	–	44,281	1,351	Dec. 31
K Mart Corp.	=	23,812	570	Jan. 27
The Kroger Co.	–	17,123	56	Jan. 31
Lucky Stores Inc.	=	17,100	138	Jan. 31
J.C. Penney Company Inc.	+	14,740	478	Jan. 31
American Stores Co.	–	14,021	145	Jan. 31
Federated Department Stores Inc.	+	10,512	302	Feb. 1
The May Department Stores Inc.	=	10,328	381	Jan. 31
Dayton Hudson Corp.	+	8,793	284	Feb. 1
F.W. Woolworth Co.	–	6,501	214	Jan. 31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.

Distribution of IS Funds by Percent

The retail sector of the economy is the lowest-intensity computer user in the survey.



TRANSPORTATION

On-Line, On Track, In Air

Retailers must track market conditions quickly. The challenge faced by transportation companies is even greater; for them, quick isn't fast enough. Their customers want to know where things (and people) are instantly. Many companies in the transportation business not only use computers to tell their customers where things are, but also where they last were, where they will soon be, and, in the case of airlines hoping to fill empty seats, where they are not yet.

The dependence on interactive systems by the top companies in this sector has added to the hardware section of their budgets. In addition, the need to develop unique software has raised the costs of personnel. Thus, transportation companies spend less than the national average on packaged software and overhead.

The percentage of corporate revenue that goes for computing among these concerns is somewhat less than the national average. This is not an indication that transportation companies have somehow gotten their interactive databases up and running on the cheap. The relatively light IS budgets reflect the very high cost of running fleets of vehicles and the enormous network of personnel that these companies must support. All told, of their $55 billion in revenue, DATAMATION's 10 transportation companies together spend well over $700 million a year on their information systems.

The most intensive use of computers in this group can be found at Federal Express, which grosses much of its $3 billion annual take in units of $25 or less. Federal's package-tracking capability is the basis of its reputation for good service. Other heavy computer users can be found among the airlines, which can now not only track their own seat inventories, but can also keep tabs on some aspects of rivals' flights.

The IS managers of the travel providers' leading shops are recognized specialists in transaction processing and database maintenance. They are also very much attuned to issues affecting system reliability and availability. As one might well expect, the rail-based transportation companies are the least intensive users of computers in this sector, and the gap between the relative budgets of, say, a Union Pacific and that of an AMR, the parent company of American Airlines, is substantial.

The prospects for increased automation among these companies is bright. Airlines are extending their reservations systems into the offices of travel agents, and their support for other travel-related services is also expected to grow. In the future, airlines may develop profile databases for key customers, much the way car rental firms and some independent travel agents already have established customer "clubs." Ultimately, the airlines may extend their liaisons from the current base—travel industry firms and in-house travel departments at large companies—to smaller corporate users of their services.

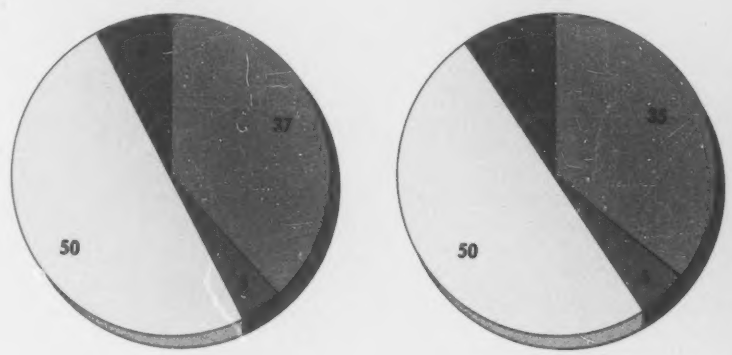
The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
UAL Inc.	=	9,198	12	Dec. 31
Burlington Northern Inc.	–	6,941	–528	Dec. 31
Union Pacific Corp.	–	6,574	–414	Dec. 31
CSX Corp.	–	6,345	418	Dec. 31
AMR Corp.	+	6,018	279	Dec. 31
Santa Fe Southern Pacific Corp.	–	5,631	–269	Dec. 31
Delta Air Lines Inc.	+	4,460	47	June 30
Norfolk Southern Corp.	=	4,076	519	Dec. 31
Trans World Airlines Inc.	=	3,145	–106	Dec. 31
Federal Express Corp.	+	2,606	132	May 31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.

Distribution of IS Funds by Percent

Personnel for software development at transportation companies consumes a larger than average chunk of IS money.



UTILITIES

Dialing for Dollars

When compared with their corporate counterparts in other sectors of the economy, the 10 largest utilities are not power users. The utilities claim that only a small fraction of their more than $121 billion in revenue is spent on budgeted information systems each year—$1.2 billion—even though there is evidence from outside sources that these companies spend twice that amount. As much as a quarter of the total computer-related expenditures of this group are the outlays of just one company, AT&T, which has by far the most installed hardware in the industry.

In addition to spending somewhat more than the average amount on personnel, utilities are big spenders on software, buying outside packages at one-and-a-half times the national average. This makes the utilities group's aggregate hardware budget an undersized slice of a substantial pie. Telephone companies include some of their call data collection equipment in their switching systems budgets, however, and this distorts their accounting self-portraits. Once data are collected, the large utilities go at their billing and analysis in much the same way as other companies with many small transactions do: big mainframes with immense disk farms do the sorting, while banks of laser printers churn out the bills.

Most of the big companies in this group are only separate entities by virtue of the AT&T breakup. While some of these Baby Bells have gone their own way, many still hew to the operational procedures developed when they were part of AT&T. Examples of such companies include Nynex and BellSouth. A similar spending pattern occurs among the telephone-based rivals of AT&T, of which giant GTE qualifies as one of DATAMATION's top shops. This translates into dependence on IBM's mainframe operating environment for large jobs, and the extensive use of minicomputers from other vendors (including AT&T) for smaller ones.

Beyond next year, as the telephone utilities go through a period of laying off some of their employees—in a customer environment that just keeps dialing, piling up big-dollar utility revenues—their budgeting pictures will change. AT&T, for one big example, has already cut staff equivalent to the population of a small city, and is expected to remain trim. Hardware expenditures will grow, relative to those for personnel. Nevertheless, the capital expenditures these companies make for computers will always be tiny compared with the costs of staffing to maintain their networks and switching centers.

Other utilities have a similar need for large outlays that overshadow computer purchases. Southern California Edison, the top shop among electric utilities, puts a lot more of its revenue into power generators than into its computer rooms' power consumers. But its sophisticated billing operation shows that here, at least, IS doesn't hide its light under a bushel.

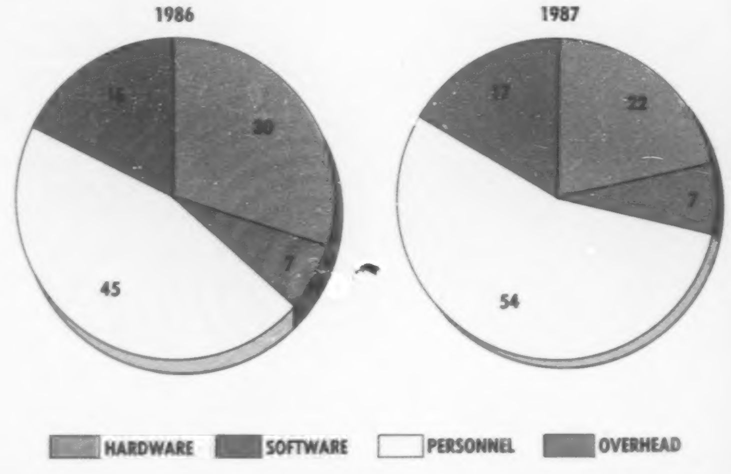
The Top 10

COMPANY	IS INTENSITY*	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
AT&T Co.	=	34,087	139	Dec. 31
GTE Corp.	=	15,112	1,184	Dec. 31
BellSouth Corp.	=	11,444	1,589	Dec. 31
Nynex Corp.	=	11,342	1,215	Dec. 31
Bell Atlantic Corp.	=	9,921	1,167	Dec. 31
American Information Technologies Corp.	=	9,362	1,138	Dec. 31
Pacific Telesis Group	=	8,897	1,079	Dec. 31
U.S. West Corp.	=	8,308	924	Dec. 31
Southwestern Bell Telephone Co.	=	7,902	1,023	Dec. 31
Southern California Edison Co.	=	5,312	714	Dec. 31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.

Distribution of IS Funds by Percent

Utilities spend more of their computing dollars on software than do companies in any other business sector.



Methodology

Based on 1986 revenue figures, DATAMATION selected the 15 largest U.S. companies in each of 12 predetermined industry groups. Two questionnaires requesting detailed information on 1986 and 1987 information systems budgets were mailed to each of the companies.

From the survey responses and other company information, DATAMATION identified the top 10 companies in each of the industry groups and then analyzed information systems expenditures within each industrial sector. Companies within each of those sectors have been ranked according to their 1986 revenues.

Each of the participants was asked to supply total IS budget figures, and total expenditures for functions associated with IS but not included in the IS budget. They were also asked to identify how that budget was allocated among hardware, software and services, personnel, and overhead.

The terms used were defined as follows:

Hardware comprises all computer gear on the IS budget, including data communications. Software and services pertains to all funds allocated for buying software or hiring outside software developers. Personnel encompasses all employee costs for the computing operation. Overhead includes charges associated with the physical plant, including utilities and rent.

Wherever possible, information included in DATAMATION's top shops report was obtained from the companies themselves. When a company did not provide information, or did not provide it in a form suitable for this survey, we have estimated figures, based on investigative reporting and an analysis of industry trends.

In the interest of discretion, and as a courtesy to those respondents who cooperated but who also asked that certain specific facts about their companies be kept confidential, we have not published specific budget line items. Instead, we have provided data on sector aggregates and comparative information on each sector's members. The comparative data are based on total budgeted expenditures and do not include off-budget estimates.

Every effort has been made to include the most significant computer users in each of the 12 categories. Owing to the size of such a comprehensive survey as this, however, some large IS shops inadvertently may have been omitted from our listings. It should also be noted that, because the size of businesses operating within each sector varies to a great degree from industry to industry, some of the companies that failed to make our roster may in fact be larger users than companies in other sectors that did qualify for inclusion in our listings.

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Living with the High Yen

Caught between a weak dollar and a rising yen, information systems suppliers in Japan had their profits squeezed in 1986, despite some healthy increases in local sales revenues. IBM Japan came off worse than most, ending the year with a drop in revenue that left the company in jeopardy of losing its number three position in the DATAMATION Japan 10. Japanese users, however, began to breathe cautious sighs of relief as their budgets again showed an increase after a flat year in 1985.

BY ROBERT POE

The yen rose 29% against the dollar, and Japan's leading information systems suppliers, including IBM, were unable to react quickly enough to protect their bottom lines in 1986.

Despite the economic pressures, the Japanese market for information systems (IS) achieved reasonable growth compared with other industrial sectors last year, registering an estimated 8.6% increase to ¥5,131 billion ($30.4 billion).

The tendency for a few giants to dominate the Japanese market showed little sign of changing. The combined revenues of those companies placing in DATAMATION's ranking of the top 10 information systems companies in Japan hit ¥4.338 trillion ($25.7 billion) in 1986, accounting for a hefty 84% of the total domestic IS market. The four biggest firms pulled in 58% of the business.

Fujitsu again dominated the DATAMATION Japan 10 table, followed by NEC at number two. IBM Japan just held on to third place, staving off the fast approaching Hitachi. NEC took the honor as the fastest growing company in the 1986 ranking (see Figure 1), although it was unable to push Fujitsu out of the top slot as Japan's biggest dp supplier worldwide (see Figure 2).

There were only minor changes in the actual rankings of the Japan 10, despite the economic uncertainty. Toshiba managed to take fifth place back from Matsushita, which entered the DATAMATION Japan 10 table in 1985. Matsushita is predominantly a consumer electronics company, and it suffered from a lack of any flagship IS products that could stop the company's overall revenue slide.

Toward the end of the year, all of the companies suffered to some degree from the contraction of business in the main manufacturing sector in Japan—living with the high yen had begun to take its toll on cash flows. Nevertheless, there was much growth in the nation's finance sector and also among smaller Japanese companies, many of which began to take automation seriously for the first time.

Growth in these sectors helped account for a general easing of Japanese users' data processing budgets, which increased by an average of 9% in 1986, according to figures published by the Japan Information Processing Development Center (JIPDEC).

The JIPDEC survey shows that the Japanese market is emerging from the slump of 1985, when budgets inched up only 1.9%. Even though the 9% increase in 1986 was an improvement over the previous year, the market has not recovered entirely, and there are still questions about the effect that the high yen will have on budgets over the next few years.

Japanese users seemed to prefer trying to squeeze more work out of their old machines than buying new ones in 1986. Although total hardware expenditures were up last year to ¥24.2 million ($143,000) per month, money spent on cpu payments was actually down by 7% to ¥3.45 million ($20,484), and cpu depreciation costs were up 4% to ¥709,000 ($4,200). I/O device expenditures, on the other hand, were up 41% to ¥2.72 million ($16,100), with storage devices down 17% to ¥1.05 million ($6,210). On-line terminals were up 4% to ¥6.3 million ($37,200).

DATAMATION's Japan 10

1986 RANK	1985 RANK	COMPANY	OWNERSHIP	1986 JAPAN DP REV ($ MIL)	% CHG ($ U.S.)	% CHG (YEN)	1986 TOTAL DP REV ($ MIL)
1	1	**Fujitsu Ltd.**	Japan	5,457.8	54.7	9.5	6,575.7
2	2	**NEC Corp.**	Japan	5,122.9	72.8	22.3	6,324.6
3	3	**IBM Japan Ltd.**	U.S.	3,821.1	38.1	–2.2	49,591.0*
4	4	**Hitachi Ltd.**	Japan	3,806.7	62.2	14.8	4,728.8
5	6	**Toshiba Corp.**	Japan	1,979.8	53.8	8.9	2,605.0
6	5	**Matsushita Electric Industry Co.**	Japan	1,632.9	41.5	0.2	1,944.0
7	7	**Nippon Telegraph & Telephone**	Japan	1,160.5	51.9	7.5	1,160.5
8	8	**Mitsubishi Electric Corp.**	Japan	1,102.9	45.8	3.3	1,345.0
9	10	**Nippon Univac Kaisha Corp.**	Japan/U.S.	985.9	55.6	10.1	985.9
10	9	**Oki Electric Industry Co. Ltd.**	Japan	668.5	7.3	–24.0	879.6

*Includes parent company revenues

Expenditures for staff, software, and services rose faster than those for hardware. Much of the increase in the "other" category resulted from money spent on communications lines, which at ¥2.22 million ($13,200) amounted to 4.3% of the monthly total.

While the top 10 companies were pulling in the ¥4.338 trillion ($25.7 billion) from their home market, they made another ¥984 billion ($5.8 billion) from exports and sales by their foreign subsidiaries—19% of their combined total dp revenues. Exports, however, played a mixed role in the 1986 results.

On the one hand, Japanese Ministry of Finance statistics show that exports of general purpose computers and peripherals rose 10.3% to ¥1,217 billion ($7.2 billion) in 1986, despite the strong yen. The previous year's increase was a mere 1.7%. This export growth is not as good as it sounds, however. Three companies—NEC, Hitachi, and Toshiba—had higher growth rates in the Japanese market (see Figure 1), which means that they were unable to follow the traditional Japanese manufacturing strategy of growth through exports. Moreover, the 10.3% export hike is a far cry from the heady days of the early 1980s when computer exports grew at rates ranging between 59% and 99% a year.

In a year of a falling dollar, those exports to the U.S. didn't come cheap either. To keep dollar prices the same between 1985 and 1986, a Japanese company had to accept an average of 29% less in yen for the same piece of equipment. This overseas sacrifice battered the bottom line, where profit drops in the 50% range were not uncommon.

So, with growth in the U.S. market stifled because of the shifts in exchange rates, Japanese manufacturers had to fight that much harder over their domestic market. How hard they fought is illustrated by an overall drop in the level of imports into Japan despite the cheap dollar, which made U.S. goods more attractive. Ministry of Finance figures show that computer and peripheral imports actually declined by 21.3% in 1986 to ¥192 billion ($1.14 billion).

IBM Japan's Total Revenues Are Down

Ironically, one of the companies most hurt by export dependence was IBM Japan, which shipped almost 27% of its output to IBM subsidiaries in other countries. Total revenues were off 3.9%, with exports down 8.3%.

Oki Electric, the other big dp exporter, which gets 24% of its business from abroad, did far worse. In addition to depending too much on the export trade, Oki relied heavily for its sales on commodity peripherals—products that are among the most sensitive to price and currency fluctuations.

Oki had a terrible year, and its 24% nosedive in Japanese dp revenues for 1986 pushed it into the bottom position, giving Nippon Univac (NUK) the ninth slot. In fact, Oki barely held on to its place in the table above NCR Japan, which just failed to make the grade.

The most significant slide in revenue, however, hit IBM Japan, which recorded a local sales downturn of 2.2%, leaving its third place standing very vulnerable to Hitachi, which posted a healthy 14.8% increase.

Revenue problems aside, IBM once again seemed to be the center around which the Japanese dp industry revolved in 1986. According to some estimates, by the middle of 1986 IBM's share of the installed base of large mainframes had increased by more than 4% to over 32%, while its 5550 micro had taken second place in business pc sales. The fourth quarter turned sour for the company, however, as the Japanese manufacturing sector, which accounts for some 40% of IBM's sales, cut back drastically on capital expenditures in response to problems stemming from the weak dollar.

Although its sales performance was less than impressive, IBM showed its power in other ways, mostly by flexing its operating systems muscle. In the fall, Hitachi came to a relatively amicable settlement of its OS copyright dispute with IBM. This involved a cross-licensing deal, which, so far, seems to be working well.

Strain On IBM-Fujitsu Relations

Fujitsu's relations with IBM, meanwhile, worsened perceptibly when a copyright agreement dating back to 1983 came into dispute again. That led to further negotiations between the two companies at the American Arbitration Association. Though Fujitsu is coy about the details of the case, the word among industry observers in Tokyo is that the company is now stuck with payments to IBM of around ¥1 billion ($6 million) a month until 2002.

As a result, 1986 saw possibly the most significant differentiation to date between the strategic positions of the world's two leading pcms on the OS front. In most eyes, Fujitsu came out looking far worse than Hitachi, a disadvantage

% CHG ($ U.S.)	1986 TOTAL REVENUE ($ MIL)	JAPAN DP REV AS % OF TOT DP REV	DP REV AS % OF TOT REV	NET INCOME ($ MIL)	1986 JAPAN EMPL	1986 TOTAL EMPL	FISCAL YEAR END
52.6	10,384.5	83.0	63.3	155.7	84,000	89,000	March
68.1	15,034.8	81.0	42.0	200.5	93,346	101,227	March
2.1	51,250.0*	7.7	96.7	4,789.0	20,447	20,447	Dec.
63.9	28,984.4	80.5	16.3	739.1	131,000	161,000	March
61.9	20,135.5	76.0	12.9	230.6	117,600	121,000	March
34.3	29,615.4	84.0	6.5	1,003.4	120,749	135,749	Nov.
51.9	31,265.4	100.0	3.7	928.2	299,600	300,000	March
44.1	12,250.7	82.0	10.9	113.6	62,331	71,479	March
55.6	985.9	100.0	100.0	16.6	4,121	4,121	March
–1.2	2,229.1	76.0	39.4	–14.8	13,991	18,686	March

multiplied by the fact that an estimated 40% of Fujitsu's revenues come from mainframes and related products, as opposed to less than 10% for Hitachi.

The bad news soon reached Europe, where West Germany's Siemens dumped the Fujitsu operating system and began supplying Fujitsu hardware only with its own non-IBM-compatible BS2000 system. Furthermore, the new West German pcm company, Comparex Information Systems, formed by merging the pcm interests of Siemens and BASF, decided that it would concentrate on Hitachi hardware and wean users off of Fujitsu.

While Fujitsu repeatedly insisted it would continue offering IBM-compatibility "to the extent there is customer demand for specific functions," and announced a new operating system that was said to be 95%-compatible, it also tried to disown the pcm label by claiming that it, "does not intend to feature every function provided by IBM as a plug-compatible supplier would."

Operating system jitters were also said to be behind the half-year delay in the first shipment of the M-780, Fujitsu's answer to the Sierra, which had been announced in November 1985.

Comparatively oblivious to these IBM disputes, NEC continued to speed along with its strategy of incompatibility. Last year, NEC made one of its most strategic corporate moves ever in the international dp arena. Together with Honeywell of the U.S. and Compagnie des Machines Bull of France, it helped form a new company based on Honeywell's Information Systems division. NEC took only 15% of the new joint venture, which was less than expected. While NEC says it wasn't interested in a larger stake at the time, the modest investment was probably to avoid any controversy similar to the proposed Fujitsu purchase of Fairchild Semiconductor. The situation wasn't helped by the revelation that a Honeywell DPS 90 sold earlier to the U.S. Air Force Military Airlift Command was in reality an NEC machine using Honeywell software and peripherals. Despite its low-key involvement in the new entity, NEC is expected to be in the driver's seat as the main hardware supplier and eventually to increase its stake to a more substantial figure.

Mainframes Running Unix Are Unveiled

The long-rumored possibility that Japanese companies would finally turn to Unix as a way out of the compatibility dilemma was spotlighted in 1986 when all of the big three—NEC, Fujitsu, and Hitachi—introduced mainframes running Unix in either native or guest mode.

Unix also figured prominently in another attempt to bolster Japanese software independence: the Sigma project. The five-year, ¥25 billion ($148 million) program, sponsored by the government, is aimed at producing on-line systems tools to assist in sophisticated software development. It is supposed to do for Japanese software what earlier projects did for semiconductors and supercomputers—make it internationally competitive by combining the R&D efforts of the government with those of the major companies in the field.

Unix was chosen as the basic operating system around which the various software and hardware tools are being designed. Its first full year of operation was 1986, and significant progress was made toward developing the specifications of the workstations and software productivity tools that will form the backbone of the system.

Some observers suspect that Sigma is more about workstations than about software. According to the Tokyo office of the securities firm Morgan Stanley, U.S. companies now have around 85% of the Japanese workstation market—an enticing target for the local firms. During the year, an impressive number of manufacturers brought out Unix-based workstations, including relatively minor dp players, such as Casio, Ricoh, Sharp, and Sony. As the first commercial versions of the Sigma workstation are introduced—sometime around the end of this year—intense competition is expected to drive prices down over a short period. The result may be low-cost Japanese hardware that will be a prime candidate for export to the U.S., probably running U.S.-developed software.

Even what had been billed as the first all-Japanese operating system, and the powerful 32-bit microprocessor it was to run on—jointly known as TRON (The Real-time Operating Nucleus)—turned out to have a Unix workstation angle. The machines developed for sale in Japan were expected to run one of the TRON operating systems; however, Hitachi and Fujitsu are also working on a version of Unix that will run on the same chip, primarily for machines for export.

NEC Sells Supercomputer in U.S.

At the top end of the product spectrum, supercomputers were at the center of a major trade controversy. NEC became the first Japanese company to sell one of the powerful machines in the U.S. when—amidst charges of huge discounts—it placed an SX-2 with the Houston Area Research Consortium. There was no uproar, however, when the company formed a joint sales company with Honeywell, called NEC-Honeywell Supercomputers Inc. So far, the new company has been handling maintenance and service on the original Houston machine, but has made no further sales.

On the home front, the failure of government agencies and universities to buy anything except Japanese-made supercomputers, accompanied by reported discounts of as much as 80% by Japanese makers, became a full-fledged trade dispute by the end of the year. The aggressive overseas and domestic sales tactics of Japanese manufacturers, combined with the government's actions, brought accusations that Japan was targeting yet another U.S. industry for eventual domination.

Trade friction did not hinder developments in the low end of the IS market very much though. Japan made its first major inroads into the U.S. pc business with the successful Toshiba laptops. Most popular was the T3100, which featured advanced plasma display technology that low-cost Asian clone makers couldn't hope to match. The less expensive T1100-Plus supertwist LCD model also did well. These IBM-compatible machines were introduced in January 1986, and by the end of the year some 25,000 per month were being exported, mostly to the U.S. Typically, the Japanese version was not introduced until last December.

FIGURE 1 **Fastest Growers**

JAPAN 10 RANK	COMPANY	% CHG (YEN)	JAPAN DP REV ($ MIL)
2	NEC Corp.	22.3	5,122.9
4	Hitachi Ltd.	14.8	3,806.7
9	Nippon Univac Kaisha	10.1	985.9
1	Fujitsu Ltd.	9.5	5,457.8

FIGURE 2 **Leading Japanese Dp Companies**

	COMPANY	WORLDWIDE DP REV ($ MIL)	% CHG ($ U.S.)	% CHG (YEN)
1	Fujitsu Ltd.	6,575.7	52.6	8.0
2	NEC Corp.	6,324.6	68.1	19.0
3	Hitachi Ltd.	4,728.8	63.9	16.0
4	Toshiba Corp.	2,605.0	61.9	14.6
5	Matsushita Elec. Indus. Co.	1,944.0	34.3	-4.9
6	Mitsubishi Elec. Corp.	1,345.0	44.1	2.0
7	Nippon Telegraph & Telephone	1,160.5	51.9	7.5
8	Seiko Epson Corp.	1,035.7	91.2	35.2
9	Nippon Univac Kaisha Corp.	985.9	55.6	10.1
10	Ricoh Company Ltd.	933.8	26.6	4.1

NEC also continued to dominate the domestic pc market with an estimated 50% share, led by its 16-bit PC-9801. Its network of 10,000 consumer electronics shops and 200 specialized microcomputer retail stores contributed markedly to its sales success. Fujitsu takes only third place in pcs in Japan, following consumer electronics maker Sharp.

Bright Markets for Domestic Sales

Though the woes of the manufacturing sector put a heavy damper on domestic dp sales, some bright spots remained in the market in 1986.

One sector that showed a strong demand for IS products was the financial industry, which was preparing to meet the challenges of deregulation in the world's financial markets. Not only were Japanese securities firms setting up global information networks as they went international, there was also an explosion of foreign firms setting up or expanding in Tokyo. Fujitsu and IBM in particular benefited from this trend.

The growing demand for networking systems helped the market for telecommunications equipment continue to expand last year. The role of the nominally privatized telecom giant Nippon Telegraph and Telephone (NTT) however, was tempered by political pressures for high-profile procurements of foreign equipment. The digitalization of NTT's networks gets most of the credit for an 80% increase in the sales of digital switching equipment in 1986, according to securities firm Vickers da Costa. The increase for 1987 is estimated to be 85%. NEC, NTT's traditional supplier, is the telecom leader, with Fujitsu in second place.

There was an increased demand from small companies too, especially the suppliers of the major manufacturers, which are traditionally the first to feel the squeeze when Japanese exports get tight. Ironically, this segment became a more promising growth area than the larger manufacturers in 1986, as automation became an absolute necessity for survival.

The small company trend is of benefit to NEC in particular, as the leading supplier of smaller business computers. The trend also helps Toshiba, which does not manufacture mainframes, but has concentrated on midsize distributed processors. This growth in demand is reflected in Japanese user budgets during 1986.

These user budgets are expected to increase again in 1987, but it is not yet clear just how much of a debilitating effect the high yen will have on the flow of cash from the corporate coffers to the IS departments in Japan.

One of the most significant effects of the drastic increase in the value of the yen in 1986 may have been to upset some long held notions about the superiority of Japanese manufacturing in general. The huge drop in corporate profitability resulting from lower overseas revenues suggests that a large part of Japan's competitive edge in the past may have stemmed from macroeconomic structural advantages. As such advantages began to disappear, Japanese manufacturers reacted much as their American competitors had years earlier, cutting costs at home and moving as much production as possible overseas.

Methodology

The 1986 Japan 10 survey was compiled exclusively by DATAMATION from information culled from our in-house database, which tracks the results of over 200 companies worldwide. All revenue and earnings figures have been adjusted to calendar year calculations and converted to U.S. dollars using the OECD average exchange rate for the year.

For a specific definition of data processing-related revenue, see "The DATAMATION 100" methodology, June 15, p. 37. ■

DATAMATION

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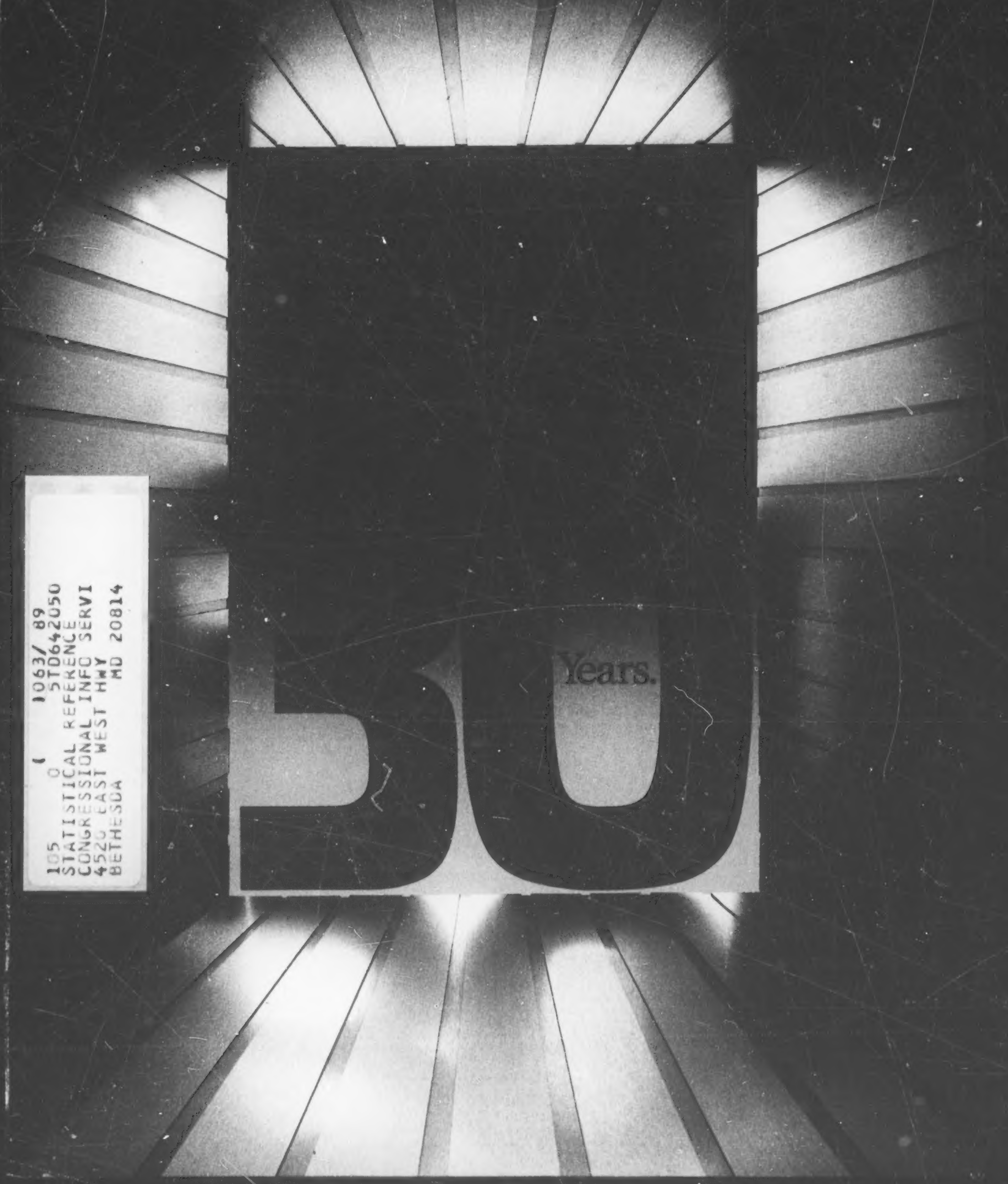

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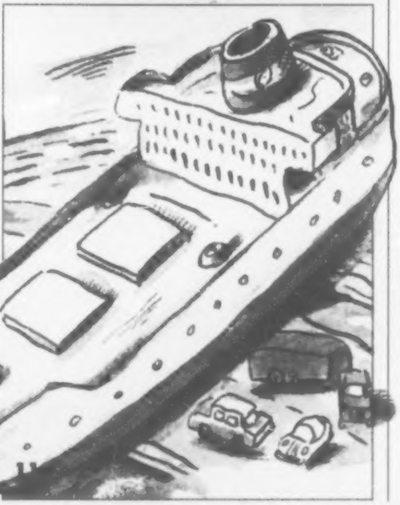

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Cover Photograph by Walter Wick
Typography by James Montalbano

Coming in the next issue:
A Special Report: How Competitive Is the U.S. Computer Industry?
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Unix: What Users Are Saying
The Long Shadow of DB2
The Golden Rules of Global Networking

SEPTEMBER 15, 1987
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1987 JESSE H. NEAL AWARD

Editorial

Taking a Technology Trip

Back in 1957, an industry was born. So was a magazine. DATAMATION was the first to provide in-depth coverage of a technology destined to change the world.

During those 30 years, we've tracked the companies, machines, people, and programs that have helped shape society and the information processing profession. At the same time, DATAMATION has played an instrumental role in helping to shape and define the realm of information technology.

That legacy lives on.

When I began here 11 years ago, I felt a real sense of awe at the respect DATAMATION commanded in the U.S. and abroad. Harking back to my college sorority days, I felt I'd successfully "rushed" DATAMATION and that I was now going to be initiated into the lofty ranks of the most prestigious publication in the computer field. "Congratulate your daughter," I told my mother. "I'm pledging DATAMATION!"

Last January, I made another pledge—to top the editorial package I put together for the magazine's 25th anniversary issue. After much brainstorming, the DATAMATION editors charted an itinerary, a travelogue of articles to take you on a journey through the dramatic changes and trends that have shaped the industry, the technology, and the careers of IS practitioners.

To launch our voyage, we inaugurated the DATAMATION Hall of Fame. After six months of research, we selected a roster of 30 distinguished pioneers of information processing (p. 56).

We held roundtable talks, at which IS pros put their careers and computing in context. Complementing our discussion with veteran IS execs (p. 48) is our panel with tomorrow's technology chiefs (p. 126).

No trip through a number-crunching industry would be complete without numbers, so we've given you a graphic look at the changes that have occurred in the IS arena over the last 30 years (p. 77). We tracked the changes in attitudes toward automation by carefully culling the cartoons in DATAMATION that best characterize the humor of the times (p. 90).

To illustrate just how deeply entrenched technology has become in everyone's professional and personal lives, we took a long day's journey into a world where all the computers go on the fritz (p. 110). Our most ambitious technology tour takes you to the future—to the year 2017, the network age where MIPS factories and AI create a new corporate structure and working environment, a world changed anew (p. 142).

Linda Runyan

LINDA RUNYAN
SENIOR EDITOR

Three Decades By the Numbers

BY PARKER HODGES

In an industry where numbers do much of the talking, it makes sense to let numbers describe some of the changes that have taken place since DATAMATION and this industry began growing up together. In 1957, there were only a few computers shipped, 700 or so. Still, that was a huge jump from the year before, when, according to industry veteran Frederic G. Withington, there were only 500 computers—total—in the U.S. But 1957 was a year holding extraordinary potential for this industry: the transistor was just about to enter the commercial mainstream, transforming all electronics and creating a platform upon which today's information industry would be built.

The industry's explosive growth did not take place in a vacuum, however. The world was changing even as computers changed the world. Figure 1 makes one trend very clear: for three decades, the United States and Western Europe steadily have been losing dominion over the world's gross production. Perhaps most surprising is that the largest percentage decline in the U.S.'s "market share" came during the boom years of the 1960s. Figure 2, describing a 15-year core within recent history,

FIGURE 1 Share of World GNP, By Percent

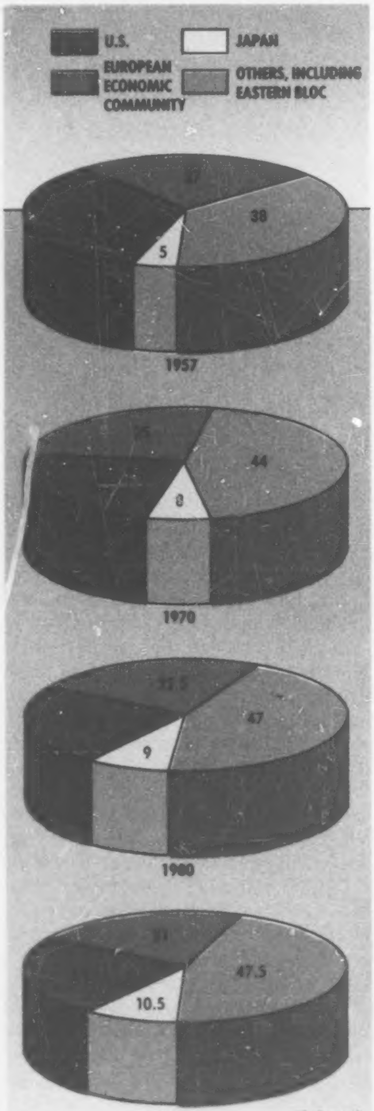


FIGURE 2 U.S. Share of Selected Technology Exports

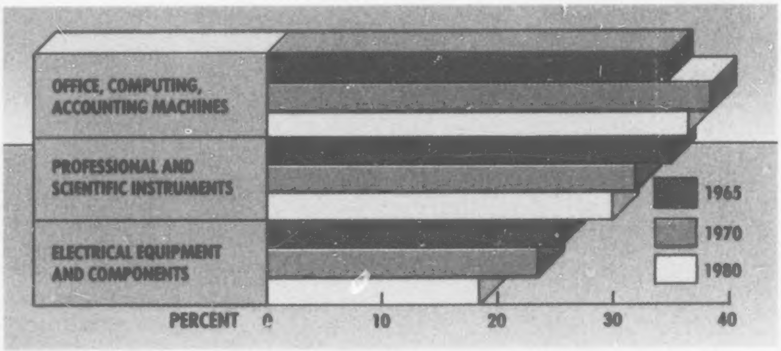
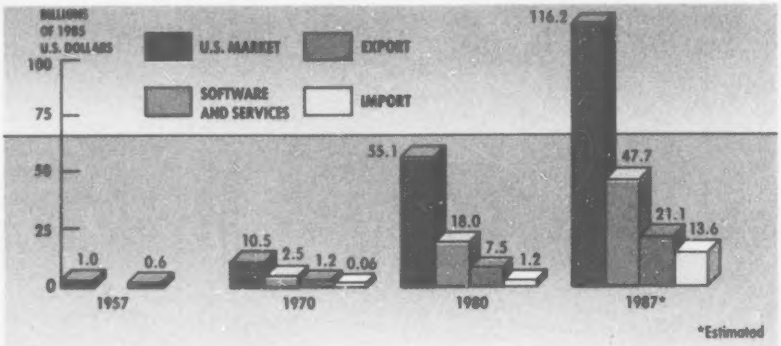


FIGURE 3 U.S. Computer Market—Exports and Imports



Charts by Hayes Cohen

Three Decades By the Numbers

FIGURE 4 U.S. Consumption of Micros, Minis, and Mainframes

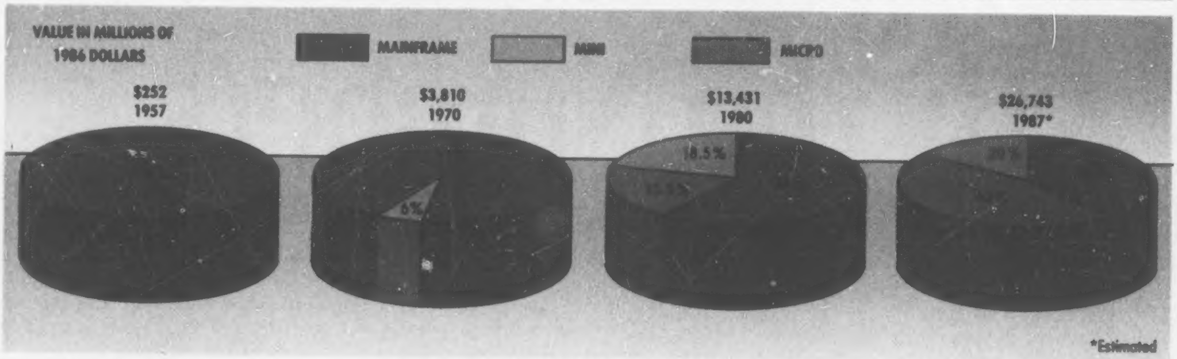


FIGURE 5 Shipments of Micros, Minis, and Mainframes

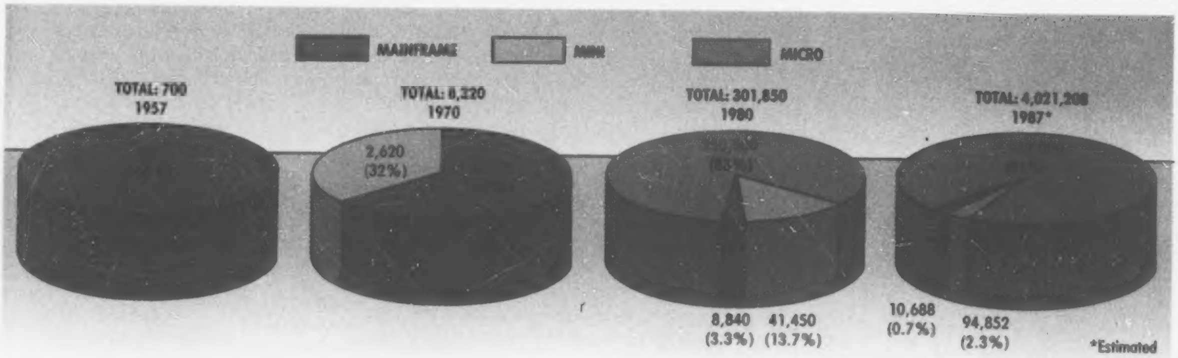
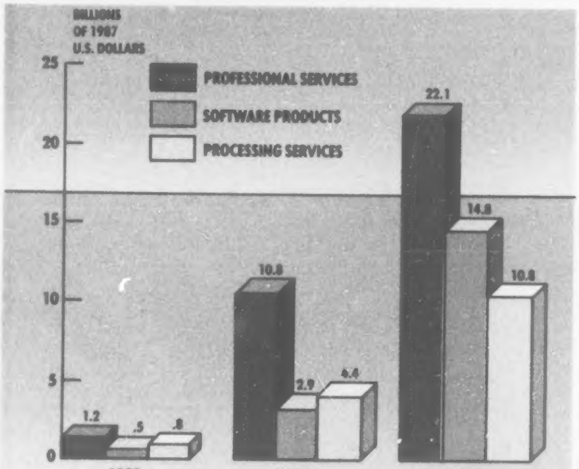


FIGURE 6 The Growing Software And Services Industry



shows how the U.S., in three markets linked to the information industry, has experienced decay in its leadership. Still, so far, the much discussed U.S. trade deficit is *not* in computers and related equipment: DATAMATION estimates the U.S. exported $7.5 billion more in 1987 than it imported (see Figure 3).

What no one apparently dreamed in 1957 is what is so apparent in Figure 4: the birth and blooming youth of the microcomputer. Figure 5 makes this even more evident: U.S. computer shipments are now 5,745 times greater than they were in 1957, and almost half of them are microcomputers. Another booming sector is described in Figure 6: from nonexistent in 1957 to $2.5 million in 1970, the software and services segment of the business this year will reach almost $50 million.

Figure 7 shows the number of workers employed by vendors of computer and telecom equipment and services and in the civilian labor force. In 1960, workers in the computer industry made up just 0.14% of the U.S. civilian labor force. Telecom workers were 0.11%. In 1987, computer industry workers represent 0.41% of the labor force and telecom workers 0.89%.

Figure 8's numbers begin in 1972, the first year in which the Bureau of Labor Statistics began keeping track of them. Figure 8 shows the number of workers in several computer industry occupations. Figure 9 shows how salaries have changed for those employed by the vendors of computers, software, and services. The chart shows the actual dollar amounts, not adjusted for inflation; in purchasing power, therefore, the

FIGURE 7 Computer and Telecom Manufacturing Jobs

(AVERAGE ANNUAL EMPLOYMENT IN THOUSANDS)

	1960	1970	1980	1985	1987*
COMPUTER INDUSTRY	101	191	354	445	501
TELECOM INDUSTRY	820	1,106	1,236	1,058	1,079
CIVILIAN LABOR FORCE	69,628	82,771	106,940	115,461	120,126

*Estimated

employees. While these workers are on the front line of computer occupations, their productivity supports millions of other information workers. Clifford Nass of Stanford University, who has published widely on the sociology of work, told DATAMATION that in 1987 more than 43% of all civilian labor done in the U.S. can be classified as information work. Marcel Porat, in *The Information Economy: Definition and Measurement*, puts the percentage even higher. He suggests that in 1960 information workers made up 46% to 47% of the U.S. workforce. By 1980, almost 54% were information workers, and the percentage has remained relatively flat since then.

The basis for all this activity has been research and development. Figure 10 depicts the way in which U.S. investment in these vital activities has changed over the past three decades. Figure 11 shows how the U.S.'s most powerful trading rival is financing its own R&D activities, specifically how large a piece of Japan's basic information systems work is financed by its powerful PTT. In 1957, when the U.S. was already investing almost $700 million annually on computers, Japan was yet to begin

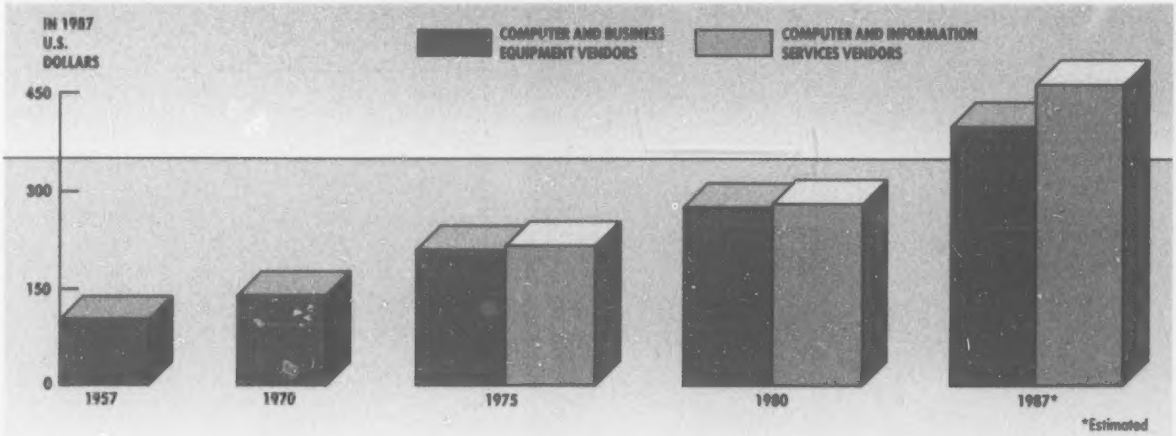
FIGURE 8 Employment in Some Computer Occupations

(IN THOUSANDS)

YEAR	TOTAL	SYSTEMS ANALYSTS	PROGRAMMERS	COMPUTER & PERIPHERAL EQUIPMENT OPERATORS	COMPUTER & KEYPUNCH EQUIPMENT OPERATORS*	COMPUTER SERVICE TECHNICIANS
1972+	792	75	188	199	284	46
1973	808	87	190	220	255	48
1974	855	99	203	251	251	51
1975	966	124	228	302	253	59
1976	1,000	139	235	295	279	52
1977	1,007	132	228	311	284	52
1978	1,155	155	255	403	277	65
1979	1,349	181	330	465	279	94
1980	1,448	205	351	535	271	86
1981	1,492	213	367	564	248	100
1982	1,712	242	434	588	364	84
1983	1,733	276	443	605	311	98
1984	1,815	300	455	630	320	110
1985	1,940	335	485	690	315	115
1987*	2,244	408	563	813	329	131

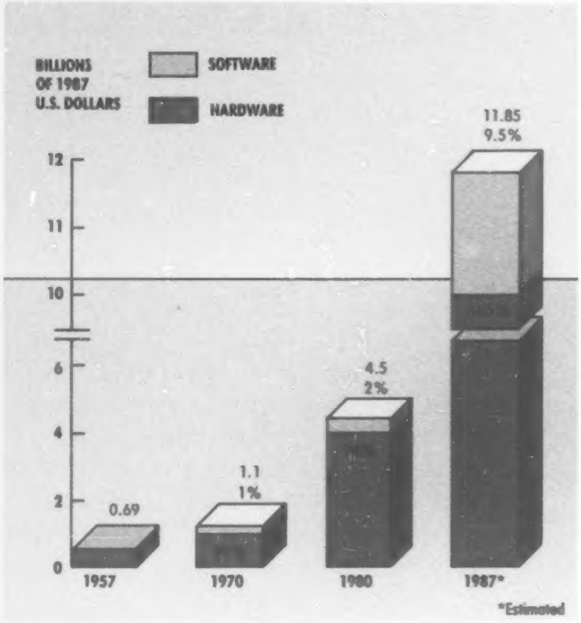
*Estimated +First year these statistics were compiled

FIGURE 9 Weekly Earnings by Industry Sector



*Estimated

FIGURE 10 U.S. Computer R&D Spending



$700 million annually on computers, Japan was yet to begin spending. By 1987, Japanese R&D investment still amounted to less than a third that of the U.S. Figure 12 shows the growth of the industry, the improved efficiency of computing, and the growth in programmers' productivity over three decades.

The last four charts all continue the story of the astonishing change in the cost of computing since the birth of the industry. Figure 13 shows that—while almost everything else was getting more expensive—the average yearly decline of the cost of various system elements over the past three decades ranged between 11% and 27%. As Figure 14 shows, however, inflation in the late 1970s played havoc with prices: for almost a decade, prices rose instead of fell. Still, as can be seen in Figure 15, the cost of a general purpose cpu now is about a third of what it was when DATAMATION began publication (using 1986 dollars and 1957 dollars, respectively). It seems fitting to close, in an issue that focuses on memories, on the cost of computer memory: as Figure 16 clearly shows, nowadays it costs a whole lot less to remember things than it did three decades ago. ■

These charts were assembled by Svein Borgersen of the International Ratio Group, Princeton, N.J. For some of the data in the charts, we are grateful to the following. Figures 1, 3: The U.S. Department of Commerce, International Trade Administration. Figure 2: U.S. Competitiveness in the World Economy, *Bruce Scott and George C. Lodge, Harvard Business School, 1985. Figures 3, 4, 5, 6, 7, 8, and 10: CBEMA Industry Marketing Statistics. Figures 6, 7, 8, and 9: The Bureau of Labor Statistics. Figures 11, 13, 14, 15, and 16:* Targeting the Computer, *Kenneth Flamm, The Brookings Institution, 1987. Figure 12:* Information Processing in the United States: A Quantitative Summary, *edited by Leslie Albin and Kathleen M. Gagne, AFIPS, 1985. Figures 13, 14, and 15:* Data Processing Technology and Economics, *Montgomery Phister Jr., Santa Monica Publishers, 1979.*

FIGURE 11 Japan's Info Technology R&D

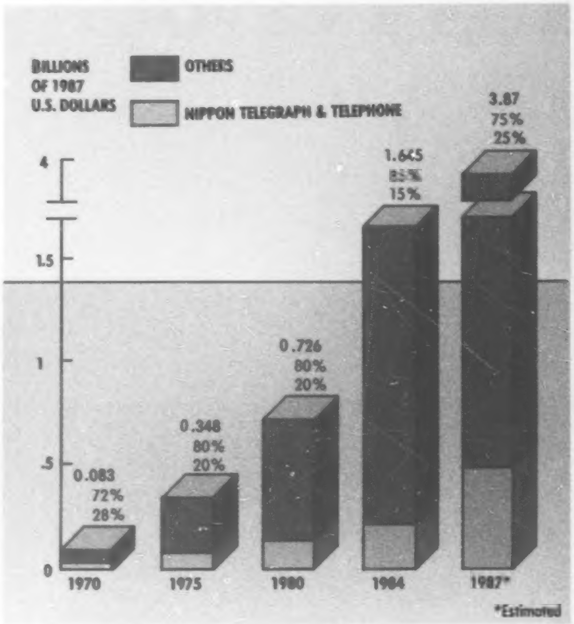
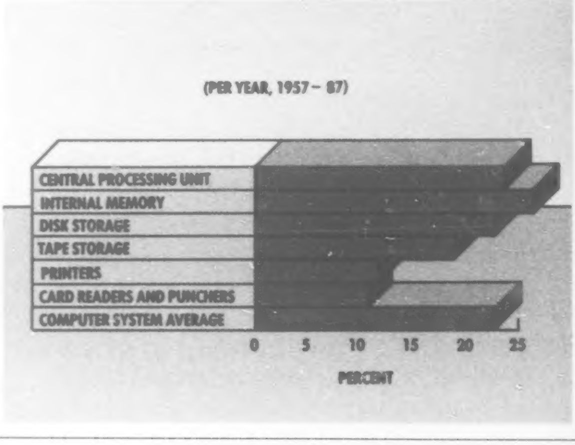


FIGURE 12 Indicators of Improvement

INDICATOR	1955	1965	1975	1985
INDUSTRY GROWTH	1	20	80	320
PRICE/PERFORMANCE	1	10^2	10^4	10^6
PROGRAMMER PRODUCTIVITY	1	2	2.7	3.6

FIGURE 13 Decline in Real Cost of Computer Hardware



Three Decades
By the Numbers

FIGURE 14 Cost Changes for an Average System Without Terminals (PER YEAR, 1957–86)

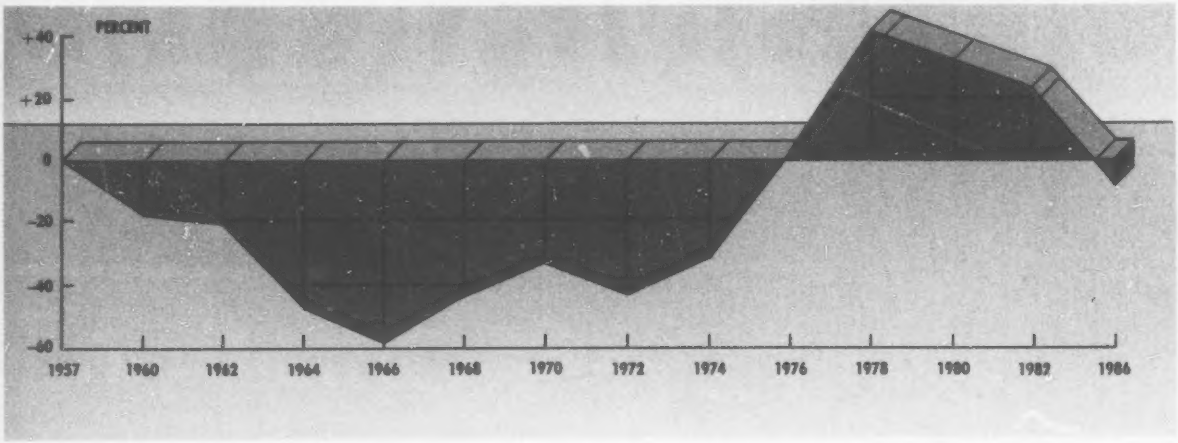
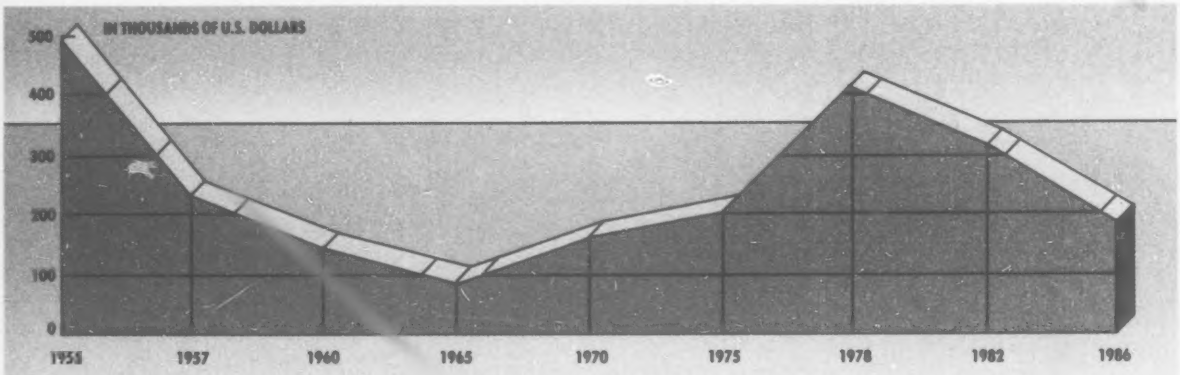
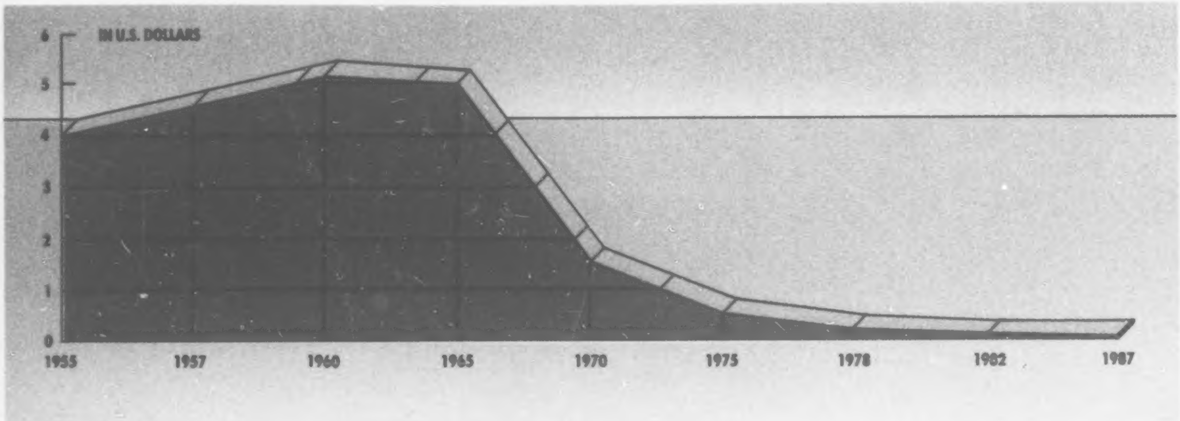


FIGURE 15 Average Price of Cpu*



*General purpose computer, excludes minis and other small computers

FIGURE 16 Average Price of Main Memory Per Byte



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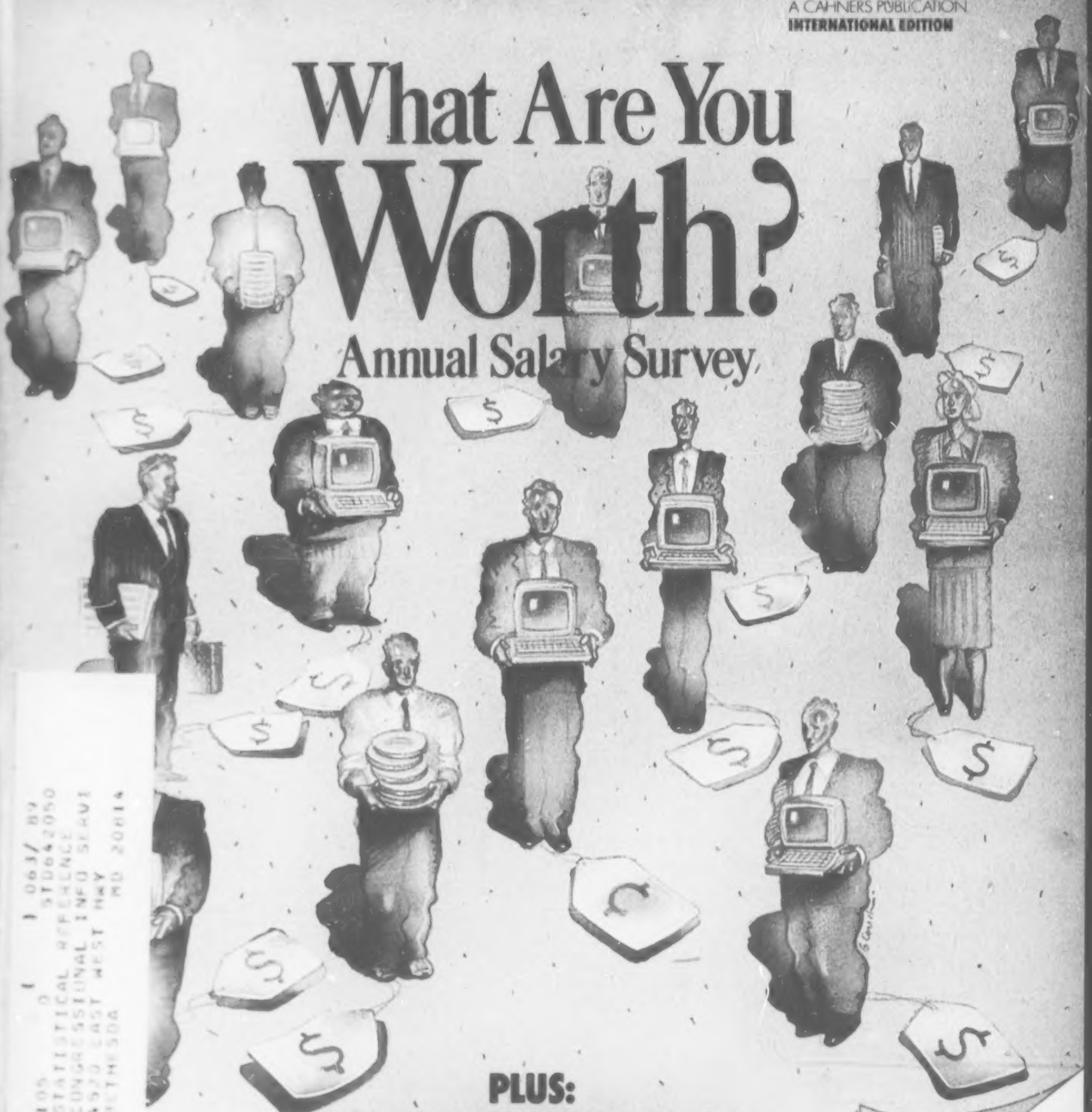

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SEVEN RULES OF GLOBAL NETWORKING

KEEPING AMERICA COMPETITIVE
A SPECIAL REPORT

DATAMAT

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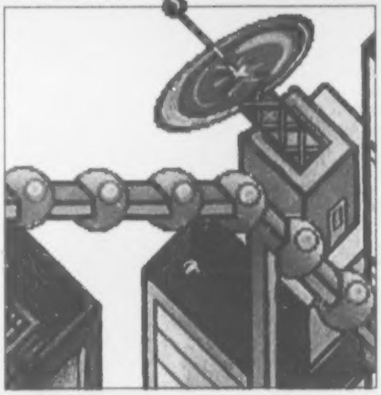
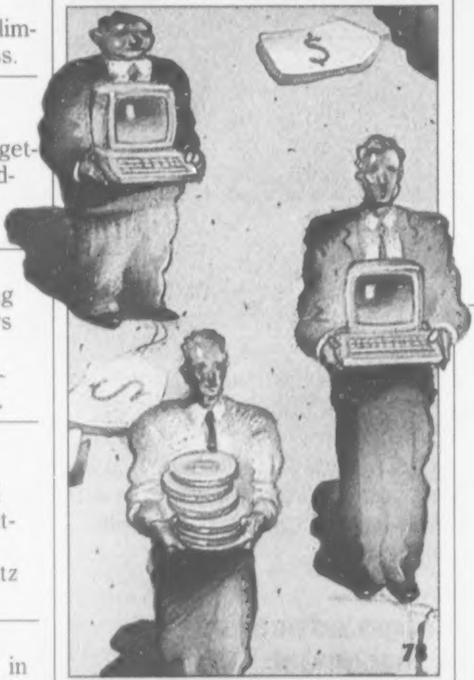
How competitive is the U.S. computer industry? DATAMATION examines the industry's standing in five important product areas and probes its health as diagnosed in Washington and Tokyo. Also reported are the results of an exclusive poll of readers' perceptions of U.S. competitiveness.

FEATURES





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ACHIEVEMENT
AWARD

1987 JESSE H. NEAL AWARD

Editorial

Competitiveness: The Challenge Is Yours

The challenge of keeping America competitive, as well as the task of keeping up with America, falls squarely on you—the executives and professionals who manage IS for the nation's companies, institutions, and agencies. Everybody, from the ceo to the clerk, is counting on you to choose and run the systems that will create and sustain a competitive advantage for their enterprises in the world marketplace.

Such an advantage is sought in nearly every sector of the information business. Manufacturers demand factory automation solutions that will lower production costs. Government agencies insist on communications networks that will improve their efficiency. University heads require state-of-the-art computing environments that will attract the best and brightest professors and students. All are motivated by a single goal: to improve the standard of living for their constituencies—be they shareholders, taxpayers, or society in general.

The challenge is made all the more difficult by nationalistic sentiments. Should you buy products and services only from vendors headquartered in your native country? Or should you choose the best systems and software, regardless of their country of origin?

The choice is not an easy one to make, as reflected in the responses of customers and vendors interviewed in the course of compiling this issue's special report on U.S. competitiveness (p. 39). "My role is to get the most cost-effective solution to a business problem. If that means an NEC drive, so be it," says an MIS director at Morton Thiokol Inc. "Can we afford to let everything go?" worries the chairman of U.S.-based vendor Harris Corp., who has seen his company resort to offshore sourcing in computer terminals and some communciations equipment in order to stay competitive.

You have an obligation to your employer to see that it buys the best information technology products—whether they are from North America, Asia, or Europe. But you also owe it to your company to devise an intelligent purchasing strategy—one that takes into account more than just pricing. You must consider how much different vendors are spending on R&D, what level of service and support can be expected, and the longevity of the product line.

Such a strategy only stands to make your organization more competitive.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

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ABP ABC BPA

Letters

Misconception

As one of the principal designers of the Floating Point Systems' T Series parallel supercomputers, I feel both qualified and compelled to correct a prevalent misconception about the machine, one that is reflected in a recent Look Ahead item (July 15, p. 12).

While the Inmos Transputer chip is a most critical element of the machine, and Inmos gave prompt and thorough support in order to help us in the use of their excellently engineered and nearly indispensable computer, major products of other companies are also essential parts of the machine. These companies also gave great assistance in helping us design with their new and innovative parts, none of which was available when the design was started.

Weitik 64-bit floating point multipliers and accumulators give the machine its fast floating point arithmetic, which peaks at 16MFLOPS per node. Texas Instruments supplied memory and a most flexible micro sequencer, both of which provide for the full use of the speed of the arithmetic parts. The use of higher-performance Weitek parts was designed long before the original chips were even available. Higher-speed Texas Instruments memory was also planned long in advance. Faster parts from any or all of these companies can be incorporated with either minor or no changes in design or to the boards. For example, the new floating point Transputer, just coming on the market, will increase performance in several ways.

The installation of one of the largest—if not the largest—computers in the world, a T-100, seems also to have been the computer media's biggest nonevent. A 128-node T-100 with 16MFLOPS peak per node for a total of 2.05GFLOPS peak and a possible effective performance of three fourths of that speed, was installed this year at Los Alamos, N.M.

This machine is, as are all other T Series computers, expandable, without any change, to a maximum of 16,384 nodes or 200,000,000,000FLOPS. The standard connectors already installed on every cabinet, as well as the standard cables delivered with every cabinet, already allow for such an expansion, but a large, specially designed building, more properly termed a metacabinet, is required.

ROBERT F. BENNION
Computer System Architects
Provo, Utah

Inappropriate

I appreciated very much the Readers' Forum by Daniel P. Dern, (June 15, p. 174) explaining why he likes Unix. It was full of a contagious sense of fun, and crystal clear in its presentation of his reasons for liking Unix. The revelation for me was that these are the same reasons I would use to say why I don't like Unix. (Different men swear by and at jockey shorts for exactly the same reasons.)

Even after 18 years at the keyboard, I find myself strongly aligned with the other (or is it just *an*other?) large, legitimate group of computer users: those who appreciate, perhaps even need, "user-friendly" behavior from their tools. To call an operating system "a tinkerer's delight," a challenging amusement that makes "Adventure" pale by comparison; to describe its rules as "so copious that you can't digest it all," with learning driven by mistakes; to describe it as "a box full of mysterious powers" that "increase your chances of creating new and more esoteric technical disasters" is to scare the daylights out of us.

There, I've said it. Unix scares me. Its command names *are* cryptic, it *is* "a continual gedankenexperiment," it *does* take Sherlock Holmes to figure out what it did with your data. To say that these criticisms may be muted because Unix was not developed for the casual end user is to miss the blind promotion of Unix in some quarters as the be-all and end-all. It is neither (and Mr. Dern did not say it was.) Maybe AT&T has recognized the two-edged nature of this thing called Unix, and that is why they are sometimes such reluctant parents.

I am not saying that Unix is wrong, just that it is inappropriate for many users. Those of its champions who insist on installing it in inappropriate places (the office environment, for instance), without an ameliorating shell or interface, will eventually fade away without any push from me. Those of its champions who use it well and properly will forever drop my jaw in astonishment at what they can do "on the fly." I do, however, make a plea for intelligent discrimination, and for tools that are all the more powerful because they are clear, all the more elegant because they are simple, all the more usable because they are friendly and consistent. Surely there is room for both kinds. Surely I should have a choice.

JOHN A. TROTTER JR.
Abacus Programming Corp.
Van Nuys, California

RESEARCH & DEVELOPMENT

NSF Supercomputer Centers Embroiled in Funding Dispute

The House has proposed continued funding for Phase I centers, which has Phase II users—who say they are barely surviving on current funding levels—up in arms.

BY WILLIE SCHATZ

For entities that were supposed to have been history this year, the National Science Foundation's Phase I supercomputer centers are really hanging in there.

The proposed continued funding of Phase I centers, however, has university scientists wondering about the present and future course of the NSF's advanced scientific supercomputing program. If Congress resurrects Phase I centers at the expense of Phase II centers, these scientists say, their ability to conduct advanced research and purchase state-of-the-art supercomputers will be severely hindered.

You remember the Phase I centers. They're the supercomputer facilities at the University of Minnesota, Colorado State University, and Purdue University from which the NSF was buying cycle time for its researchers back in the dark ages of 1984. When the NSF developed its advanced scientific computing initiative and established what it called Phase II centers that same year, part of the deal was that the agency's monetary support for those three Phase I centers would gradually fade to nothing.

Earlier this year, NSF canceled funding for Phase I centers (see "Render Unto Caesar," March 1, p. 19). Since then, the centers have eked out a subsistence from non-NSF funding sources.

Now, they're back, with funding to the tune of $3.5 million. That's what the House Appropriations Committee proposed this summer in its funding bill for fiscal year 1988. And Phase II center directors are howling.

"We've got a real crisis on our hands," says Larry Smarr, director of the NSF's Phase II National Center for Supercomputing Applications at the University of Illinois, Champaign. "Someone in the country has to stand up and take extraordinary action. If Congress and the NSF follow business as usual, they might as well shut the Phase II centers right now.

"The next six months is make-or-break time," Smarr emphasizes. "There's going to have to be a restructuring of the whole program. Otherwise you're going to see the painful dying away of the Phase II centers within a year."

Smarr and others are miffed because the proposed continued Phase I funding comes at a time when budget pressures are causing a lack of cooperation between Phase II centers. Says Sid Karin, director of the Phase II San Diego Supercomputer Center, "There could be much more [work done] than we're doing. But the system says, hey, don't go too far. That lack of cooperation negatively affects the centers."

Competing with Each Other

Even though all the centers have the same NSF advanced scientific computing mission, they must compete with each other for a very finite number of dollars. The House appropriation bill, subject to Senate approval, reduces NSF's $1.89 billion budget request by $50 million. Of the proposed $1.84 billion for NSF, $51.7 million is set aside for the advanced scientific computing program, under which the supercomputer centers fall. And the bill states that the NSF should use $3.5 million for the Phase I centers.

The House committees' moves have left a very bad taste in a very large number of mouths. "They set this aside by pure pork barrel," says the director of a Phase II center who requested anonymity. "If they pass this, it's an absolute scandal. It's criminal."

While Phase II supporters were distressed that science was no more exempt from pork barreling than any other government program, Phase I supporters in the legislature claimed to be merely protecting their constituents.

"I feel the Phase I centers have been very badly treated by NSF, and I urge you to remedy this injustice," Rep. Martin Olav Sabo (D-Minn.), in whose district the University of Minnesota just happens to be located, told the House Subcommittee on Housing and Urban Development and Independent Agencies. "These centers were created through local initiatives with local funds. They provided needed support to NSF researchers when they had nowhere else to go. I urge you to include some funds for Phase I centers so that NSF researchers who want to work at these centers can continue to do so."

Sabo buttressed his position with letters from a mathematician and an astronomer. The former touted the Cray-2 at Minnesota as being the only machine with a large enough memory to handle "a large class of problems which cannot be done on the other machines in a reasonable amount of time." He then took NSF to task because "it has not just cut off one of a number of centers, it has removed the only state-of-the-art machine from the basic science community." The astronomer, clearly not an expert in Washington ways, wrote that "it is very ironic that the Astronomy Division at NSF has funded our project for the next two years . . . but another division [advanced scientific computing] is prevented from giving us the money to use the Cray-2."

Offering time on that machine is exactly why the University of Minnesota believes it should be resurrected as a Phase I center. When the NSF cut off its funding, the centers' users took their money for cycle time elsewhere. The university managed to retain some of its local users and industrial partners, but overall use of the Cray-2 dropped precipitously. None of the other NSF centers—or non-NSF centers, for that matter—offers its users a Cray-2.

NSF's Budget

Proposed budgets for the next five years, in billions of dollars (actual budget for 1987 is $1.62 billion).

FISCAL YEAR	
1988	1.84
1989	2.16
1990	2.47
1991	2.83
1992	3.25

Source: National Science Foundation Authorization Act for FY '88.

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News in Perspective

"Our [NSF] users had to leave because we couldn't support them any longer," admits Jim Infante, dean of the University of Minnesota's Institute of Technology. "But we will try to woo those users back if we get funded for FY '88. We recognize that it will require a fairly high level of inconvenience for most of them. Many people who want a Unix and [Cray's Unix-like] Unicos operating system are going to have to make a really serious decision about whether to come back. And it's going to be tempered by their wondering whether the same funding crisis is going to happen again next year.

"Why should we be funded again? Because we've got something to offer that doesn't duplicate what's available anywhere," claims Infante. "No one else has a Cray-2. And if NSF's policy is to offer state-of-the-art supercomputing to as many people as possible, it's certainly counterproductive to go to exclusively Phase II centers. I hope this $3.5 million triggers a serious rethinking of NSF's present policy."

The current NSF university supercomputer initiative is a far cry from what the agency had envisioned. The original plan for supercomputing approved by Congress in 1984 called for the creation of eight to 10 centers requiring annual funding of nearly $100 million.

Fighting Over the Scraps

As FY '88 dawns, the reality isn't even close. There are five national centers with a budget of $51.7 million, give or take the $3.5 million which may or may not go to the Phase I centers. Their fate currently rests with the Senate Appropriations Committee, and then possibly with a conference committee. And forget eight to 10 centers. There are no more in sight.

The five current centers are also fighting among each other for the largest share of the money. Each center recently put its best foot forward before a program plan review panel of outside experts appointed by the NSF, which included members from the Lawrence Livermore and Los Alamos national laboratories, Goddard Space Flight Center, and the National Center for Earthquake Engineering Research. The panelists will make recommendations to NSF as to which center gets how much. NSF isn't bound by the panel's views, but the agency isn't about to ignore them either.

"OUR USERS HAD TO LEAVE; WE COULDN'T SUPPORT THEM."

"This is the only peer review in the history of the program," a supercomputer center director said after his presentation. "They've needed it for a long time. If the panel told me to shut down my center, I couldn't argue with them. That's how much respect they've got in the scientific community.

"But sometimes I think NSF is more concerned with money than science. They told me in July that I'd have to take a $500,000 cut in FY '87. I'm already $4 million short for basic services in FY '88. I could put an upgrade in this place that would blow your mind. I've got a deal in place with four major computer vendors. But with the kind of money they're giving us, they're crippling the program. Fifty million is a joke. It needs to be doubled to $100 million annually."

So, if NSF practices what it preaches, we're talking about some serious money. The prevailing sentiment on Capitol Hill is very much in favor of substantially increasing NSF funding. The House Science Committee has already authorized a doubling of NSF's budget by FY '92 to $3.25 billion (see "NSF's Budget").

Meanwhile, Phase II center directors say they are tired of acting like fund-raisers instead of scientists.

"We spend an unbelievable amount of time fund-raising," San Diego's Karin says. "Is my time or Prof. Larry Smarr's time or [director of the Phase II Theory Center at Cornell University] Prof. Ken Wilson's time well spent fund-raising?"

Phase II May Self-Destruct

"The $3.5 million for the Phase I centers isn't going to make or break us," Karin says. "But it's an indication of what NSF's thinking. I think they want to open the program up again and not even restrict supercomputer usage to Phase I centers. If they do that, the whole program's going to self-destruct. I hope the Senate kills it [the $3.5 million Phase I allocation]."

"We're talking downstream costs of multibillions if we're going to do this right," says Smarr of the University of Illinois. "But I don't even have enough to cover my cooperative agreement right now. And when that expires in April 1990, I'm dead.

"With all this talk about U.S. competitiveness, we could have a significant impact on it. We could be in the forefront," he says. "We're like a loaded gun. But they keep pulling out the bullets. We want to get on with saving the country, but the country's not backing us up. The country had better wake up." ■

BENCHMARKS

AT&T Wins GE Contract

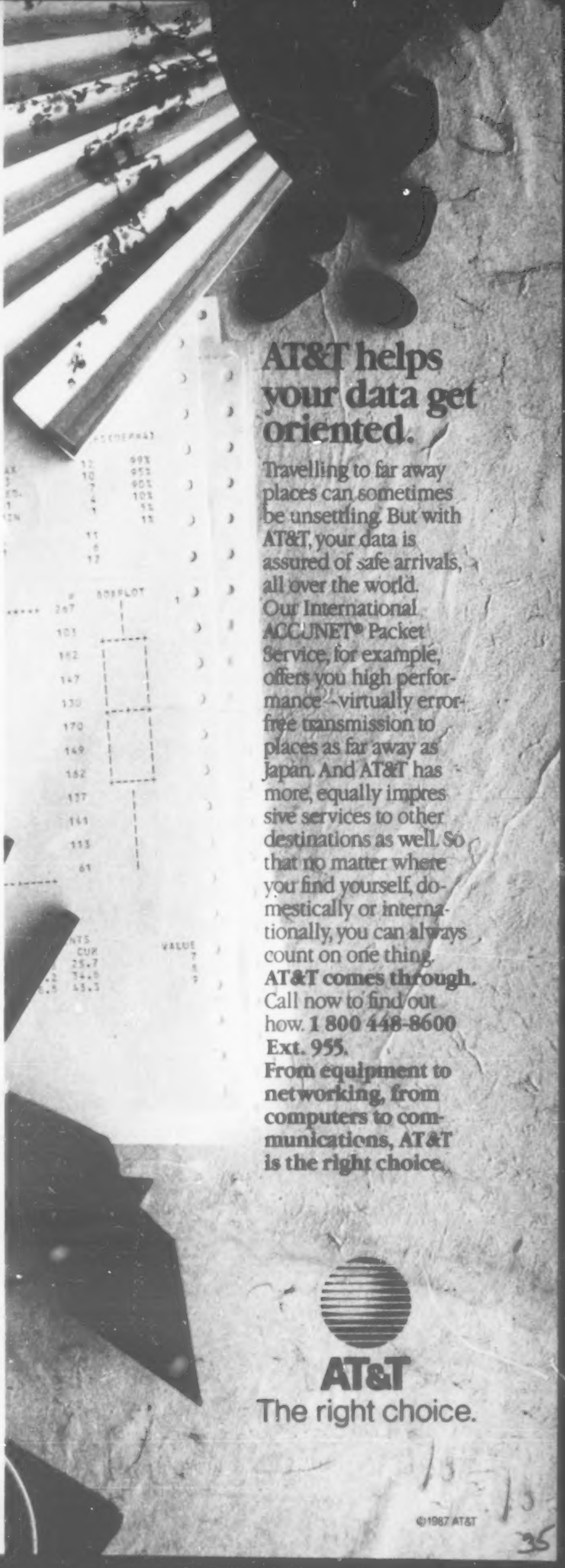
Following approval from the Federal Communications Commission and complaints from unhappy competitors, AT&T was awarded a $300 million, five-year telecommunications contract by General Electric Co. The plan calls for Fairfield, Conn.-based GE to replace old analog phone systems with a new digital network that integrates voice and data. The network will serve more than 700 locations. After a consortium consisting of U.S. Sprint, Network Equipment Technologies Inc., and Northern Telecom Ltd. lost out, complaints were filed that the AT&T bid violated FCC rules. The FCC didn't agree.

Cray Architect Resigns

Steve S. Chen, senior vice president for systems design at Cray Research Inc. and architect of the Minneapolis company's best-selling supercomputer, the X-MP, has resigned following Cray's decision to cancel a next generation supercomputer development project he headed. Cray will take a $3 million to $4 million write-off for the three months ended Sept. 30 to cover the costs related to the shutdown.

Datapoint Exec Resigns

Doris D. Bencsik, who briefly held the distinction of being one of the few women to head a Fortune 500 computer company, and who guided Datapoint Corp. through a major reorganization earlier this year, has resigned from the San Antonio company. Bencsik's resignation as chief operating officer followed close on the heels of the appointment of Robert Potter as chief executive officer. Potter was recruited from Northern Telecom Inc. in June to head the company, while Bencsik, who had been appointed acting ceo in January, was passed over for the position. ■



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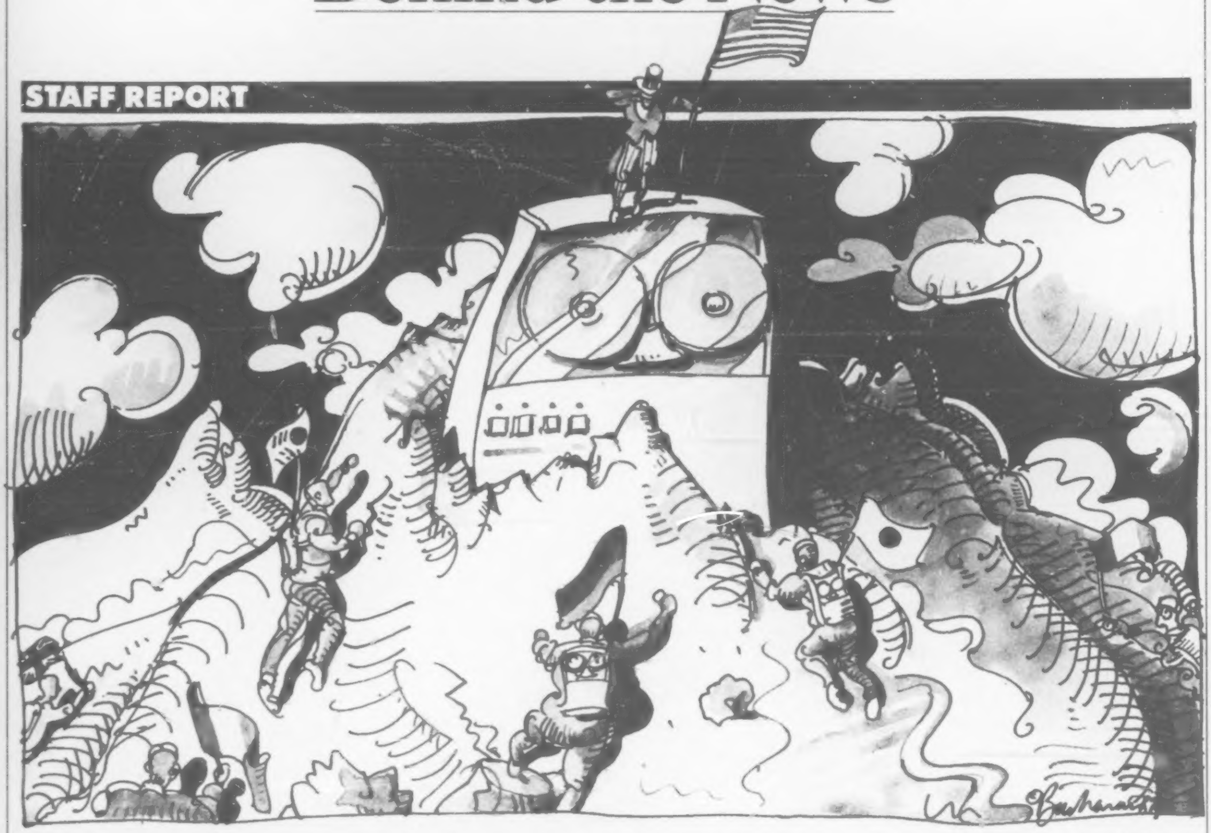
Behind the News

STAFF REPORT



How Competitive Is the U.S. IS Industry?

Though challenged, it still leads in most technologies. An exclusive poll reveals that computing pros want a strong U.S. industry maintained.

BY DAVID R. BROUSELL

Competitiveness. From Route 128 in the Northeast to the software factories of California, the word has become corporate America's new battle cry. In nearly every speech by a corporate chief executive, in nearly every announcement heralding a new product, this cry can be heard. Business has awakened from its torpor, first induced by the successes of the mid-1970s and later sustained by the recession of the early '80s, and has renewed its sense of self-worth after enduring a stinging series of industrial embarrassments, most notably in electronic components. Yankee pride has been piqued; the old juices are flowing again.

For U.S. industry, the word "competitiveness" does not mean merely more sales or market share. Having and keeping a technological as well as a marketing edge is the reward, not the motivation. This drive for competitiveness can perhaps be found in a deeper desire to preserve a uniquely American identity, as well as to turn back a perceived threat to the American standard of living.

That threat is reflected, at least partially, in the U.S. Commerce Department's U.S. Industrial Outlook report for 1987. It says, "In 1987, the [U.S.] computer equipment industry's historically ample trade balance could turn into a deficit, eroded by continued sluggish exports and strong import growth."

The Commerce Department reported that, in 1986, computer product exports from U.S. manufacturers, at about $13.26 billion, were down about 5% from the year before. Over the same period, imports of computer equipment into the country were up 26% to about $10.4 billion worth. Commerce predicts that, by the end of 1987, exports will have increased 5%, but computer imports will have grown another 30%. In 1986, the U.S. trade deficit with Japan grew to $3 billion from $2 billion in 1985.

The Commerce Department report

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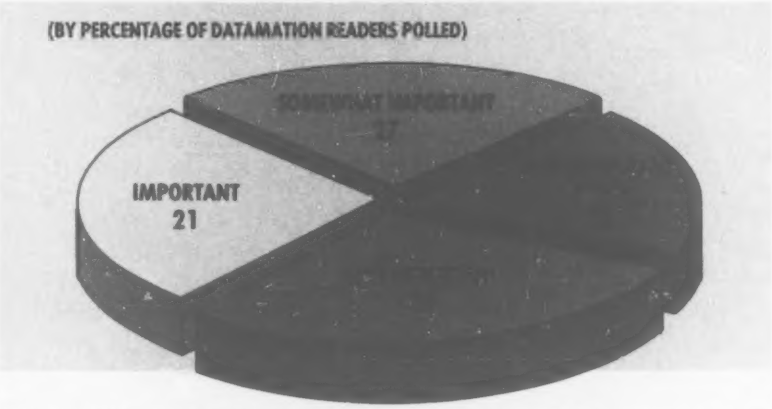
KEEPING AMERICA
COMPETITIVE

Illustrations by Yvonne Buchanan

Behind the News

FIGURE 1 **Is It Important to Buy American?**

(BY PERCENTAGE OF DATAMATION READERS POLLED)



said the shifting trade balance, coupled with a continued trend for U.S. manufacturers to go to offshore production themselves, has cut into the U.S. computer industry's employee count. The number of employes in the industry dropped 9% in 1985 and fell another 7% last year.

In many ways, the U.S. information systems industry, that cutting edge of the nation's technological prowess, is leading the charge in the campaign for competitiveness. Everything from microelectronics to supercomputers to the trade deficit in high-technology goods to the number of computer science graduates projected to emerge from colleges and universities is under scrutiny by the government, industry, and the public at large. Clearly, computer and electronics technology together are regarded as the key to remaining competitive for all American industries.

Coincident with this technological call to arms are fundamental shifts in the economic terrain. Corporate consolidation has swept through U.S. industry, and the computer arena is no exception. The creation of Unisys from Burroughs and Sperry, the triumvirate Honeywell Bull, the formation of the Microelectronics and Computer Technology Corp. and the proposed Sematech, the wave of mergers in the software industry—all reflect the need for greater efficiencies and market staying power. Big is now considered good—and necessary.

An exclusive DATAMATION poll of its readers, the users of information processing technology and equipment, presents perceptions of the state of U.S. computer industry competitiveness. A large majority of those surveyed believe that, overall, the U.S. is still a leader in all key product areas, from microelectronics to supercomputers and software and services. But they also believe the U.S. is facing serious competitive threats—most notably from Japan—in many product areas, and that the U.S. must maintain a strong industry. The concern represents a bread and butter issue: 87% of those polled say that high-technology goods and services have made their companies more competitive.

A Close Look at Competitiveness

This poll is only one part of a comprehensive DATAMATION review of U.S. computer industry competitiveness. The review itself is part of a continuing effort by the Electronics & Computer Group of Cahners Publishing Co., of which DATAMATION is a part, to report on American industrial competitiveness. In this, the first installment of a DATAMATION series that will appear from time to time, sections focus on such product areas as mainframes, minicomputers, microcomputers, supercomputers, and communications, and include views from both Japan and Washington, D.C.

A powerful sentiment culled from the poll is that IS professionals in the U.S. believe deeply in the necessity of a strong U.S. computer industry, the notion of a global economy notwithstanding. Of those surveyed, 98% say it is important for the U.S. to have a strong, indigenous computer industry. Only 1% indicate that it is unimportant because the U.S. is part of a global economy. At the same time, in what may reflect a sensitivity to price and quality, as well as such factors as compatibility, ease of use, and performance, 60% indicate an overriding commitment to buying American-made computer equipment, software, and services—39% say it is "very important," 21% call it "important," 27% say "somewhat important," and 13% answer it is "not important at all" (see Figure 1).

The spirit of nationalism is alive and well, as is a commitment to free market forces, despite the often touted Japanese model of cooperation between government and industry. The reason most often cited by poll respondents concerning the need for a strong U.S. computer industry was economic prosperity and maintenance of the general welfare; keeping up with other countries, and national security were each cited less than half as often as was prosperity. Mentioned even less often was the specific need to keep Americans employed. One consistent theme running through these readers' explanations, however, was the crucial role information technology is

FIGURE 2 **Areas of Vulnerability**

(PERCENTAGE OF DATAMATION READERS WHO PERCEIVE A THREAT TO THE U.S. COMPUTER INDUSTRY IN THE FOLLOWING AREAS)

Microelectronics	64
Mainframes	43
Microcomputers	53
Minicomputers	31
Supercomputers	40
Data Communications	36
Applications Software	24
Systems Software	17
Computer Services	13

Charts by Sharon Bystrek

FIGURE 3 Rating the Competition by Country

PERCENTAGE OF DATAMATION READERS WHO PERCEIVE A COMPETITIVE THREAT TO THE U.S. COMPUTER INDUSTRY IN THE FOLLOWING AREAS BY THESE FOREIGN INDUSTRIES

	JAPAN	SOUTH KOREA	TAIWAN	EUROPE	WEST GERMANY	ISRAEL
Microelectronics	94	12	4			
Mainframes	100	3		3		
Microcomputers	90	4	4	4		
Minicomputers	54	3	3	8		
Supercomputers	63					
Data Communications	100			7	11	
Applications Software	50	39				12
Systems Software	78		15			
Computer Services	60		36			

perceived to play in keeping the nation, and their companies, first rate.

The fundamental model on which the U.S. should base its competitive strategy, the poll showed, is the free market. In a similar vein, U.S. computing professionals firmly believe that large corporations are necessary for successful international competition.

On the question of whether the U.S. should have a national high-technology industrial policy formulated and implemented in concert by government and industry, 77% say no, that the industry should be controlled by free market forces. Only 20% are in favor of such cooperation; 3% had no answer. Meanwhile, 64% of those polled say that the U.S. should relax and/or modify antitrust laws to encourage the formation of high-tech corporate combinations to promote competitiveness. Thirty-three percent say the laws should not be changed; 3% had no answer.

In regard to specific product categories, 81% of those polled say that they believe the U.S. is still a leader in microelectronics despite the apparent dominance Japan has achieved in the markets for some electronic parts. Ninety-six percent say the U.S. is a leader in mainframes, but only 76% feel this is true of the U.S. position in the microcomputer market. Ninety-five percent perceived U.S. leadership in minicomputers; 88% in supercomputers; 85% in data communications equipment; 92% in applications software; 95% in systems software; and 88% in computer services.

The poll asked about specific product areas in which respondents perceived a potential threat from foreign competitors and from which countries in particular. The respondents indicate that, overall, the competitive threat to the U.S. is to be found in the hardware market. Software and services, on the other hand, scored highest in competitive strength.

Japan Threatens; Micros Threatened

Of all the categories, the area seen as most vulnerable is microelectronics; 64% believe the U.S. is threatened in components. Japan is picked as the chief antagonist by 94% of those who believe the U.S. faces a competitive threat in this area; South Korea is mentioned by 12%; and Taiwan is mentioned by 4%. In the mainframe market, 43% of those polled believe there is a threat to U.S. leadership, with 100% of those respondents mentioning Japan. South Korea and Europe were each mentioned by 3% of those polled as posing a threat (see Figures 2 and 3).

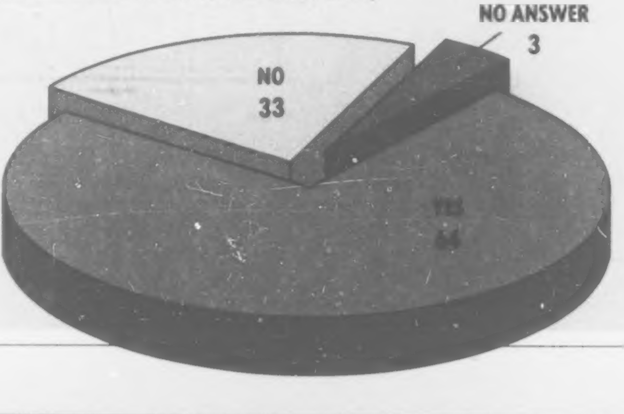
In regard to microcomputers, 53% believe that the U.S. faces a competitive threat, with 90% of them mentioning Japan and 4% each mentioning South Korea, Taiwan, and Europe. Only 31% say they see a challenge in the minicomputer arena, with 54% of them believing it comes from Japan, 3% each naming South Korea and Taiwan, and 8% picking Europe. Forty percent of DATAMATION readers polled see a threat in the supercomputer market, with Japan the one and only force to be reckoned with. Thirty-six percent see a threat to datacom, with 100% picking Japan, 7% naming Europe, and 11% citing West Germany.

Applications and systems software are seen by only 24% and 17%, respectively, as being threatened. In applications, 50% mention Japan as a competitor, 39% say South Korea, and 12% name Israel. In systems software, Japan is mentioned by 78% and Europe by 15%. Computer services came up strongest, with only 13% seeing a threat. Sixty percent of those respondents see a threat from Japan and 36% from Europe.

Even though the overwhelming majority of those polled indicate that computer equipment and services have made their companies more competitive, about 10% fewer, or 77%, say the technology is being used to its fullest potential in their companies. Seventeen percent say the equipment is not being used to the greatest possible extent; 6% had no answer. One reason often cited for this shortfall is poor management. Of those claiming success in using high-tech products to enhance competitiveness, the reason cited most often is that their enterprises are information processors and therefore these goods and services are integral to their businesses. The availability of information, and timely access to it, are also mentioned. ■

FIGURE 4 Should the U.S. Relax Antitrust Law?

(BY PERCENTAGE OF DATAMATION READERS POLLED)



"Lots of Japanese testing and process control equipment is being sold in the U.S.," including that of such companies as Anritsu, Advantest, and Hitachi. In Stern's opinion, "The idea is new—to go after the computer market not through the strength of the computer but on the strength of the equipment you can hook up to it." He warns, "Too many U.S. companies have dismissed TRON."

Unix Workstations a Target?

More mundane is the possibility that TRON may serve as the basis for a Unix workstation export offensive. Hitachi and Fujitsu are writing a version of Unix to run on the powerful 32-bit TRON mpus they are developing, with the intention of exporting Unix machines to the U.S. while domestic products are built that run the full TRON OS.

Even if Japanese manufacturers were successful in capturing large shares of the U.S. computing market, the question would remain whether or not that would be harmful to the end user. Proponents of such ideas as the "borderless economy" espoused by NEC president Tadahiro Sekimoto naturally feel not. Sophia University's Gregory, for example, feels that "the computer industry isn't a national industry, it's a global industry, so we'll see a global rationalization and division of labor. I don't think we should worry about it."

On the other hand, if U.S. users become dependent on Japanese-made hardware, whether it be supercomputers, workstations, or factory control systems, they may be vulnerable to the same problem some semiconductor purchasers are now facing: the most advanced new products go to their Japanese competitors. This may pose more of a problem for small users than for larger ones. Explains Stern, "A [Japanese] domestic client ordering large quantities will always get priority over overseas companies ordering a smaller quantity. This is a danger whenever U.S. manufacturers are overly dependent on foreign suppliers."

Many Japanese computer companies are themselves manufacturers of heavily IS-dependent industrial machinery, which would naturally have first call on new computer technology. Given such possibilities, it becomes clear that the fate of much more than computer manufacturing is at stake in the Japanese challenge to the U.S. computing industry. ■

Washington:

The Official Story

BY WILLIE SCHATZ

"Competitiveness" has achieved the same exalted status as the weather. Everybody talks about it, but no one seems able to do anything about it.

"I told my staff I didn't want to hear the word anymore," says Sen. Bill Bradley (D-N.J.), the main man behind the Tax Reform Act of 1986. "So now they call it 'the C word.' It's used so often that it's nothing more than mush. That makes it the politician's dream."

And everyone else's. You want something from someone in Washington, D.C.? Just say the C word.

The National Science Foundation (NSF) requested a 17% budget increase for fiscal year 1988 and a doubling of its budget by 1992 in what it admitted is "a period of serious fiscal constraints." Why does NSF deserve these precious bucks? "The answer, in a word, is competitiveness," the agency said in its budget request. Rep. Richard Gephardt (D-Mo.) wanted to force countries that gained "excessive" trade surpluses through unfair trade practices—of which everyone has a different definition—to reduce their surpluses by 10% annually or confront U.S. retaliation. It was an incredibly controversial piece of the House comprehensive trade bill, but citing competitiveness helped the measure pass by four votes.

Has calling the subject "competitiveness" made any difference for the computer industry? As always, there's good news and bad news. Competitiveness, like beauty, is in the eye of the beholder.

The good news is that, according to the Computer and Business Equipment Manufacturers Association (CBEMA), the information systems industry finished the first half of the year (the last period for which statistics are available) with a $2.2 billion surplus in computers. Not many other industries were in the black at the end of June.

There was much more bad news. The surplus decreased by 32.5% compared with the $3.3 billion chalked up in the first half of last year. Imports for the half rose 63%, while exports increased 19.6%. The business equipment and telecommunications sectors were $1.1 billion in the red and telecommunications was $1 billion in the red. The computer industry's positive cash flow allowed the three combined sectors, including forms and supplies, to finish with a postitive trade balance of $269.6 million, but that was 81.1% less than the comparable half in 1986. Forms and supplies accounted for a $221.8 million trade surplus in the first half of this year.

A Definition of Competitiveness

There's a theory making the rounds in Washington, however, suggesting that the trade deficit is neither the only nor the most accurate measure of competitiveness.

"There are three phases to competitiveness," Sen. Bradley says. "In the short term, we're talking about the trade deficit. For the middle term, we need to concentrate on pooling our resources for research and development. But the thing that's really going to affect our ability to regain what we've lost is a long-term attitudinal change. We've got to start thinking globally, not just nationally. And to do that we've got to change the educational system."

No piece of that triumvirate is anything to write home about. While the trade deficit has been around awhile, it has never looked this grim. In 1986, the U.S. imported $170 billion more in goods than it exported. And for the first time, the U.S. imported more high-tech products than it exported.

Why? Take your pick: decreased productivity of U.S. workers; stringent export controls that make it at best difficult and at worst impossible for U.S. firms to compete abroad; a rather large budget deficit, which skews the entire international monetary scales; unfair trade practices.

"We still act as though we have to

worry about internal competition," Carnegie-Mellon University president Richard Cyert told the American Society of Mechanical Engineers' (ASME) recent conference on supercomputers. "The real problem is to make ourselves capable of competing in the international marketplace.

"How do we do that?" he asks. "By realizing our economy is on the frontier and we have to work as hard on it as we did in settling this country. And by changing our way of thinking."

And how are we going to do that? By altering our educational system. It seems that the competitiveness fault lies not in the factories or shipyards or the backyard garages where they're creating the next Apple, but in the classroom.

"Basic research is the underpinning of everything," says Erich Bloch, director of NSF. "It's no longer natural resources that determine how competitive a country is. It's intellectual resources. The transfer to the private sector of new knowledge gained through basic research is the foundation of economic competitiveness."

That's a given, right? After all, this is the Information Age. But you'd have a hard time determining that from the bottom line. When money talks, basic research walks.

Bloch says that Japan spends a higher percentage of its total R&D budget on basic research than the U.S. Japan also turns out twice as many engineers per capita as the U.S. Last year, more foreign students than American students earned their doctorates in engineering from American universities. Most of those foreign graduates went back home to contribute to industry.

So U.S. students aren't exactly having pleasant dreams about becoming a scientist or engineer. They'd rather make a quick five or 10 million bucks on Wall Street.

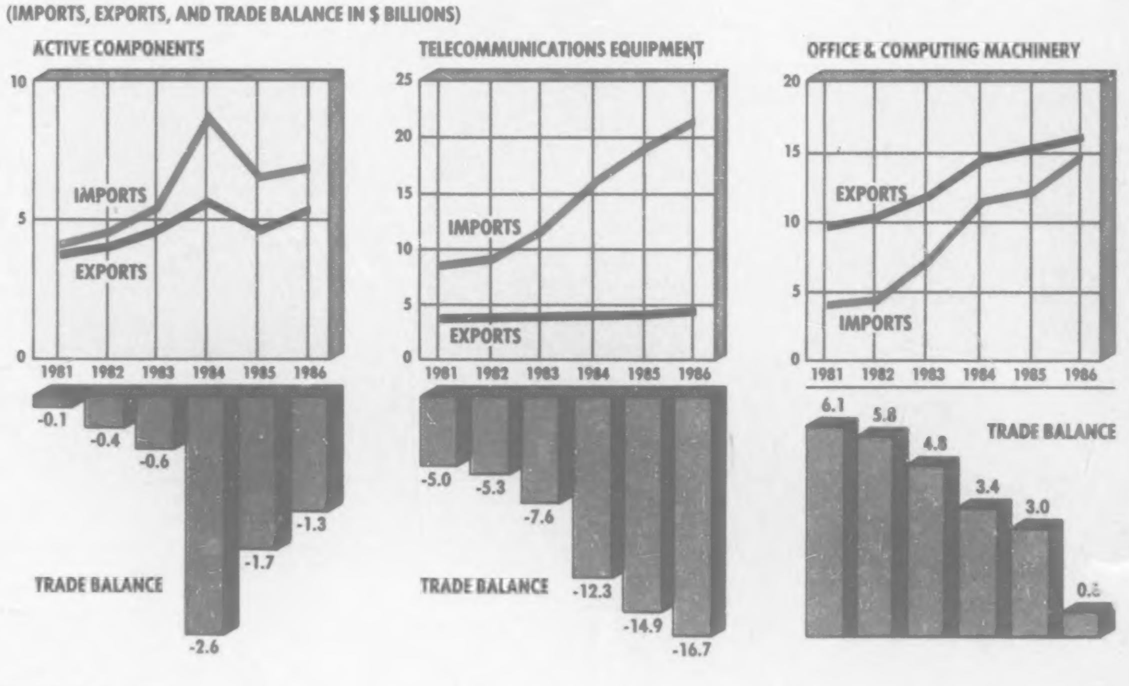
"The incentive to go into science and engineering research is not as great here as it is in other countries," says Ed Zschau, a partner in Brentwood Associates, a Mountain View, Calif., venture capital firm. The former computer executive and head of the House Republican Task Force on High Technology is now chairman of the American Electronics Association's Council on Competitiveness.

If the federal budget is any indication of where the government's head is at, someone else is going to have to do the job. According to ASME, industrial R&D and federal R&D will each total $60 billion this year. That's an all-time high for industry, but its annual R&D growth has fallen considerably behind the government's. Annual growth for industrial R&D for 1985-1987 is estimated at 2%, compared with about 6% annual increases in 1975-1985.

Total federal R&D support grew about 12% in 1986 and will increase almost 16% this year. Federal civilian R&D, however, was practically flat in real dollars between 1979 and 1984, while military R&D shot the moon. It's now about 72% of federal R&D, compared with 48% in 1979.

"We must turn ourselves around," said Paul Gray, president of the Massa-

FIGURE 5 **From Components to Computers, Imports Grow Faster Than Exports**



Source: Dept. of Commerce

Behind the News

STAFF REPORT

chusetts Institute of Technology, at the 1987 IEEE Technology Policy Conference. "We must teach engineering students and the employers of engineers to value people who worry about how things are made and about how *well* things are made. Beyond that, for our own part, we must learn how to teach manufacturing skills in ways that capture the imaginations of our best students, and we must recast the frontiers of manufacturing research in ways that will attract our best engineering faculty."

What's the first step in this long march? Would you believe the Computer Education Assistance Act of 1987?

According to one of its sponsors, Sen. Tim Wirth (D-Colo.), the bill would target funds to low-income and rural school districts that haven't had the dollars to buy the hardware and software their students need. Wirth says they need that equipment to "ensure that the next generation of graduates is adequately prepared to meet the challenges of tomorrow's technologically advanced workplace." That, of course, will ensure "improving America's competitiveness at home and abroad."

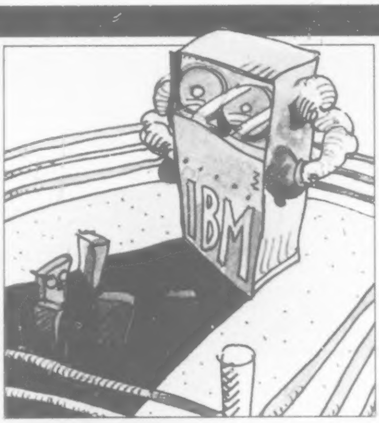
The bill has the support of a broad spectrum of the computer industry, including CBEMA and ADAPSO. But who could be against this legislation? No one. Let the record reflect that we're talking elementary and junior high school students here. That's as close to apple pie and motherhood as you can get without the real things. It's also as good an indication as any of how deeply "competitiveness" has permeated U.S. society.

"We have it within our power to restore the trade deficit and go toe to toe with other countries," Zschau continues. "But the responsibility for competitiveness lies with the companies, not the government. It's always best if you can blame somebody else, though. Politicians don't want to tell constituents they can help themselves."

And if they don't?

"Should this nation fail to meet the challenge of slow growth in productivity," Gray said to his IEEE audience, "there is significant danger that America will lose its economic—and eventually its political—leadership in the world. Sadly, there are few present indications that this nation either understands the threat or has begun to take the steps required to reverse the trend."

There's still time, but the zero hour may not be too many ticks away. ■



Mainframes:

Still a Big Blue Game

BY JEFF MOAD

The U.S. Commerce Department's report on the industrial outlook for 1987 reveals quite clearly the negative trend of increasing computer equipment imports. Most U.S. market share losses, however, seem to be coming in the microcomputer and smaller peripherals product areas. U.S. vendors of large-scale commercial computers, storage, and software appear to be holding their own against competitive pressure that is coming, primarily, from Japan. While commercial mainframe computer and large-scale storage vendors Hitachi and Fujitsu have made some small market share gains versus U.S. suppliers, American companies, led by IBM, still retain their leadership roles in key software and architecture design areas.

According to Donald Powers, research and development vice president at Control Data Corp., the Japanese "have been strong in hardware areas such as developing semiconductors and packaging them so that they get all the performance possible out of the silicon." But when it comes to software innovations or new hardware architectures, Japanese vendors "aren't as competitive as they are in building hardware."

In recent years, on the strength of advanced semiconductor and packaging technologies, Japanese vendors have succeeded in making sporadic market share headway. With a commercial mainframe uniprocessor that is significantly faster than IBM's and with more main memory, Hitachi was able to double its share of the IBM-compatible mainframe market in 1986 to 4% through its San Jose-based National Advanced Systems and Comparex European marketing partners, according to the 1987 Computer and Telecommunications Survey conducted by DATAMATION and Cowen & Co., Boston. Amdahl Corp., Sunnyvale, Calif., which sells IBM-compatible mainframes based on Fujitsu subsystems, also was able to make significant market share gains this year.

Those pcm vendors, however, never have been able to increase their combined share of the huge IBM-compatible mainframe market above 15%, according to the survey, nor have their Japanese partners been able to gain much mainframe market share on their own outside of Japan. The reason continues to be that U.S. vendors control most of the key operating system and applications software. Most users are reluctant to stray too far from the hardware vendors that can promise continued support of the existing software in which most of them have invested heavily.

The Effect of Software Dependence

That leaves the Japanese and other non-U.S. vendors of commercial mainframe hardware little choice but to remain compatible with IBM software. As a result, many overseas mainframe competitors, in the interest of maintaining IBM compatibility, cannot make use of some advanced technology—such as denser memories, dedicated database management hardware, or faster channels—until IBM does.

According to Unisys program management vice president Fred Meier, "The problem for the Japanese mainframe vendors is that currently the world won't consider another new mainframe operating system." Many European vendors and, to a lesser extent, the Japanese, have sought in Unix an open operating system alternative and a solution to their strategic software problems. Unix, however, still lacks many of the security and record-locking features found in mature mainframe operating systems such as IBM's MVS/XA. Although there have been efforts to upgrade Unix and develop a Unix standard, Meier points out that "there is no unified approach."

Observers note that U.S. vendors and researchers also continue to lead in other key mainframe software areas such as database management systems, hierarchical storage management, and performance measurement. In spite of Japanese government-sponsored re-

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Are you underpaid? Does the vice president of MIS at the company around the corner make more than you? How much should you ask for in your next raise? DATAMATION's annual salary survey reveals that increases in 1986 were up an average of 5.8%, a handsome margin above the inflation rate. Next year might not be as kind, though. Better news: turnover is down.

What Are You Worth?

BY PARKER HODGES

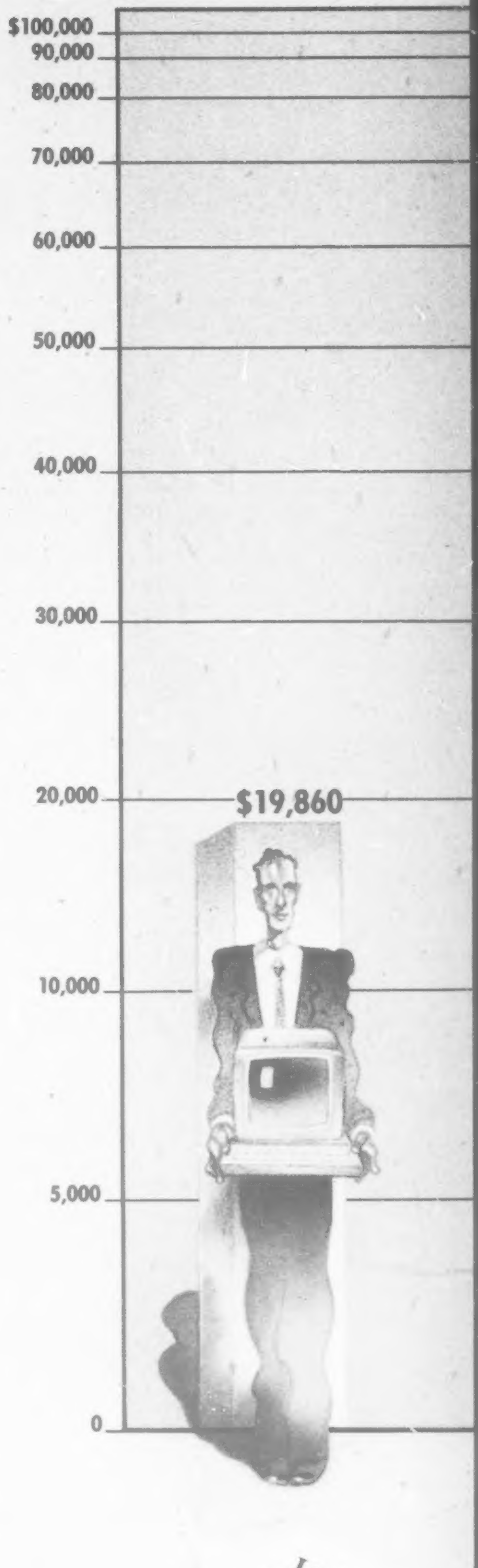
"The last two people I lost left to get more money," says William Foulds, director of information systems for St. Anthony's Ancillary Services at St. Anthony's Hospital in St. Petersburg, Fla. Foulds, like virtually every other manager in the MIS business, must deal with a feeling apparently universal among the salaried: "I'm underpaid."

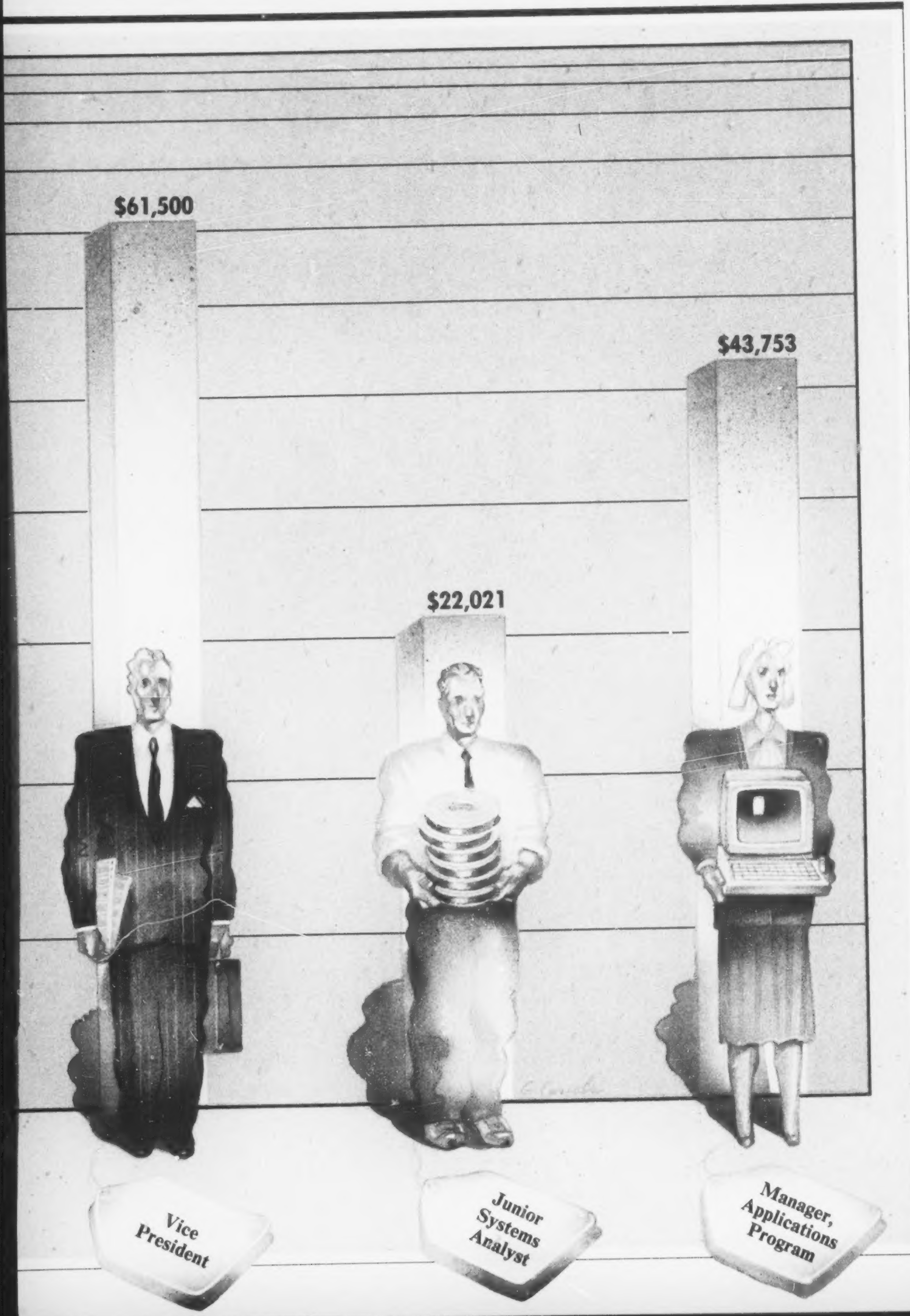
To see where you stack up on the pay scale, take a look at the two large tables on pages 84 and 86. But even if you don't beat the average for your job or your geographical area, don't feel too bad. According to the Bureau of Labor Statistics, the average yearly wage for U.S. workers in the private, nonagricultural sector was $16,253 in June 1987. Only three jobs out of the 47 surveyed came in lower than this: magnetic media librarian, data entry operator, and word processing operator.

This year's DATAMATION Salary Survey found a better paid population expecting to be even better paid by this time next year. Fully 42 of the 47 job categories report higher salaries than in last year's survey. Just over half the positions in the survey reported salaries at least 5% higher than a year ago. The jobs reporting the highest increases over last year were directors of security, pc evaluators, microcomputer user services specialists, consultants, and junior systems programmers: the average salaries for our sample in these positions were more than 20% higher than the salaries reported in last year's survey.

Two of the three losing job categories were in word processing shops: salaries for wp supervisors and wp operators were reported off 3.8% and 2.5%, respectively. The other losing job was intermediate applications programmer, reporting an average salary 8.9% lower than last year's sample. Two jobs were reported paying exactly the same as last year: junior applications programmers and lead systems analyst/programmers.

Overall, the DATAMATION sample reported that, during 1986, raises throughout the industry had averaged 5.8%, just shy of the 6% that participants in last year's survey had expected. Since inflation hit a longtime low—1.7%—in the year ending June 1986, when the last survey was conducted, those raises represented a handsome 4.1% increase in purchasing power for MIS professionals. This year will apparently see a smaller increase in spendable cash. Respondents to the survey expect increases this year to average 5.9%, just 2.1% over the 3.8% inflation rate in the year since June of 1986. While the government predicts infla-




$61,500
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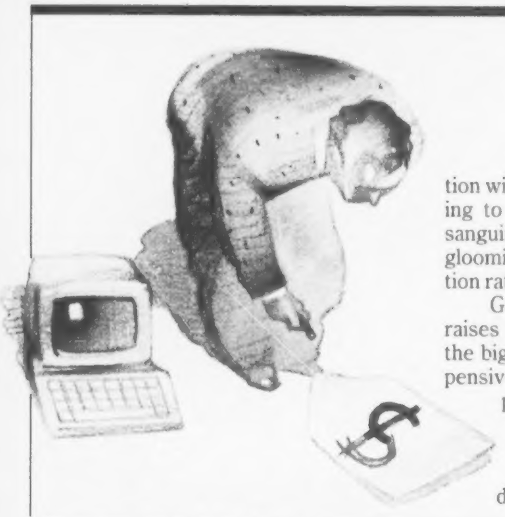
Vice President
Junior Systems Analyst
Manager, Applications Program

Illustration by Greg Couch



tion will ebb a bit in the coming year, falling to 3.2%, a minority group of less sanguine economists have painted a gloomier picture, seeing an annual inflation rate approaching 7% by early 1988.

Geographic differences in 1986 raises were perhaps predictable, with the biggest increases to be found in expensive places: New York and its metropolitan area and Los Angeles reported average raises of more than 7% (see Figure 1). The lowest average increases—under 5%—were found in Seattle, St. Louis, and Cleveland. The remainder of the country reported average raises between 5.1%—in Chicago—and 6.4%—in Washington, D.C.

Compared with other U.S. workers, these increases look healthy indeed. According to the Labor Department, in private industry, union-represented workers who signed contracts during the first six months of 1987 received pay increases of only 2.5%. Union-represented employees of state and local governments did better, averaging 5.4%. Primary and secondary schoolteachers did best, their raises under contracts signed this year averaging 6.9%. Except for the teachers, who had gotten 6.3% raises in contracts negotiated last year, this year's raises aren't what American workers have grown to expect. In June 1987, white-collar workers were averaging 3.3% more salary than they'd made a year earlier; but in June of 1986, white-collar workers had averaged 4.5% higher than in 1985. The same trend held true for professional and technical workers: 1987 wages were 3.8% over 1986; in 1986, the increase had been 4.1%.

Some studies of information systems workers seem to indicate that DATAMATION's readers are doing better than their colleagues as a whole: according to Jeff Long, a spokesman for the Administrative Management Society in Willow Grove, Pa., IS workers' raises in 1986 averaged only 3.5%, down from 1985's 5.3%.

Another area in which DATAMATION's sample seems to be doing better than many in the industry is in the expensive matter of staff turnover. Last year, the survey found that managers had expected they'd have to replace 7.1% of their employees during 1986. According to this year's survey, the actual turnover rate for 1986 was 8.8%. For 1987, these managers expect a turnover rate just a bit higher, 9.1%. The expectation of higher turnover rates confirms findings in other surveys, particularly those that show rising consumer confidence.

Roger O'Connor, a spokesman for Edward Perlin Associates, a New York firm specializing in compensation management, told DATAMATION that its studies of "the 40 or 50 largest companies" in various markets show higher turnover, rates especially in New York and Boston, where business is good and jobs are easy to come by. "In large companies in New York," says O'Connor, "turnover rate in systems is running 21%. In operations it is 14%." O'Connor says turnover rates are lower in areas where employees feel

Detailed Job Descriptions

Respondents to the survey used this job description guide.

Corporate staff: reports to senior management within corporation.

Applications programming: develops, designs, and prepares computer programs.

Systems analysis/programming: systems analysis and applications programming.

Operations systems programming: programs and maintains systems software.

Database administration: plans, organizes, and schedules the activities of the database section; establishes standards, maintains dictionary.

Datacom/telecom: develops and designs data communications networks and the installation and operation of data lines.

Computer operations: in charge of equipment, data entry, production control, and postprocessing, but not systems analysis, or other development functions.

Production and I/O control: sets up and schedules jobs for processing so as to maximize utilization and meet turnaround requirements.

Data entry: performs data entry and verification functions.

Office automation: operation of word processing equipment, intelligent typewriters, and terminals for text editing/word processing.

Job Levels

Manager: advanced degree and minimum five years' experience or equivalent combinations; strong management skills, performs personnel evaluations, budgeting, progress reporting, and project management.

Lead: bachelor's degree or equivalent and minimum four years' experience with two years in supervisory capacity; performs supervision as a project manager.

Senior: bachelor's degree or equivalent and minimum three years' experience, including some supervisory functions.

Intermediate: bachelor's degree or equivalent and minimum two years' experience; requires direction on some activities.

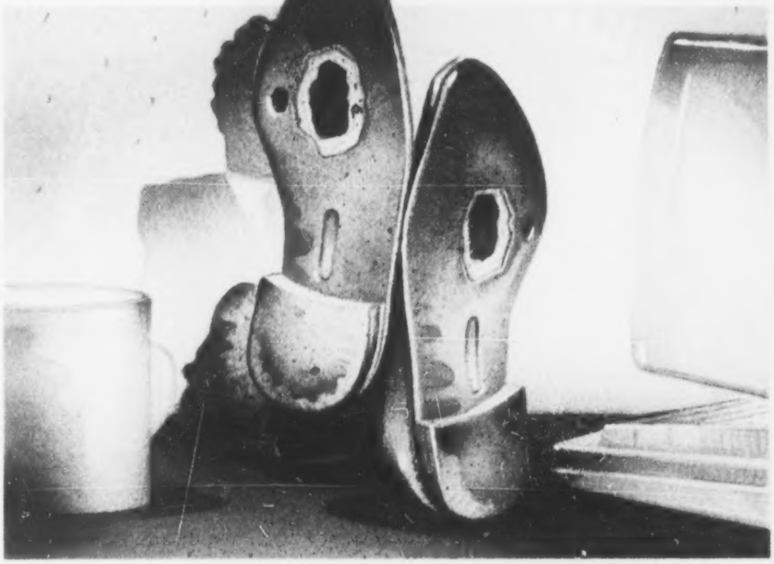
Junior: two to four years' college and six months' experience; directly supervised.

Methodology

The 1987 DATAMATION Salary Survey began in June with a questionnaire sent to 10,000 IS officials in the United States, drawn at random from the magazine's list of 64,000 top managers at computer sites throughout the country.

A total of 596 key officials returned completed questionnaires, providing information on salaries, benefits, and perquisites for 47 discrete IS positions in various industries and metropolitan areas. Half of the respondents are from Fortune 1000 companies; the other half were chosen at random and could represent companies of any size, from the smallest to the largest.

As shown in the accompanying tables, the most important labor pools covered by the survey were those in Boston, New York (divided into Manhattan and its environs), Philadelphia, Washington, D.C./Baltimore, Atlanta, Denver, Houston, Dallas/Fort Worth, Chicago, Minneapolis/St. Paul, Cleveland, Cincinnati/Columbus, Detroit, St. Louis, Seattle, San Francisco/Silicon Valley, and Los Angeles. The salary and other data were also broken down by industry category.



"more anxiety" about job availability, citing San Francisco in particular.

Of course, some companies' employees choose to stick around because they like their jobs. David Dahlke, director of data processing for Harris Farms in Coalinga, Calif., told DATAMATION that his company's longtime zero turnover rate is due to several factors, among them good pay. "We try to pay Bay Area/Los Angeles salaries in an area where the cost of living is about half." But Dahlke stresses that "the challenge of the job" can be as important as pay. The agricultural marketplace is "an unusual one" says Dahlke. "Not much has been done to develop systems in this area." In addition to intriguing problems, Dahlke's staff has also been given interesting resources with which to solve them. "We've got a lot of nice stuff to work with," says Dahlke, noting that Harris has served as a beta site for software houses and that it had the first local installation of a VAX cluster. Dahlke also adds that Harris has been "generous with training."

Equipment changes can also affect turnover rates. Dennis Foreman, data processing manager at Nico Construction Co., New York, had a zero turnover rate in 1986. This year, he's got problems: with his staff growing by a third, he'll also face a 20% turnover rate. Staffing is one reason Foreman's shop is changing vendors, moving to IBM from an old Sperry system. "It is easier to get staff for IBM systems," he says.

Ashby Lincoln is vice president of dp at Conseco Inc., an insurance holding company that owns Bankers National Life Insurance Co., Lincoln American Life Insurance Co., Lincoln Income Life Insurance Co., and Western National Life. Last year, he dealt with a 20% turnover rate. This year, he expects turnover to plunge to 5%. The reason? "We moved from New Jersey to Carmel, Ind., a northern suburb of Indianapolis." Lincoln says his new location makes hiring staff much easier than it had been in New Jersey. "In Indianapolis, we can hire from all over the Midwest." In New Jersey, says Lincoln, high housing costs in the New York metropolitan area discourage people from moving there. He adds that in New Jersey, "there are too many

FIGURE 1 Annual Salary Increases

(IN PERCENT)

	EXPECTED IN 1986	ACTUAL 1986	EXPECT IN 1987
Boston	6.0	5.6	5.6
Manhattan	8.3	7.2	11.3
NYC Metro	6.8	7.3	7.6
Philadelphia	5.9	5.6	5.5
Wash./Balt.	8.5	6.4	6.6
Atlanta	6.0	5.5	6.3
Denver	5.2	6.8	6.3
Houston	4.5	5.4	4.6
Dallas/Ft. Worth	5.6	5.5	5.5
Chicago	5.6	5.1	5.6
Minn./St. Paul	5.5	5.4	5.2
Cleveland	5.4	4.4	5.0
Cin./Columbus	6.6	5.5	5.3
Detroit	6.6	5.9	6.1
St. Louis	5.2	4.5	4.7
Seattle	6.6	3.9	3.3
San Francisco	7.2	6.3	6.4
Los Angeles	5.9	7.2	6.3
Total Sample	6.0	5.8	5.9

FIGURE 2 Turnover Rates

(IN PERCENT)

	EXPECTED IN 1986	ACTUAL 1986	EXPECT IN 1987
Boston	7.4	7.3	10.5
Manhattan	6.8	2.8	2.3
NYC Metro	6.1	15.6	10.7
Philadelphia	4.6	11.4	14.9
Wash./Balt.	13.7	6.2	8.2
Atlanta	4.9	14.3	6.8
Denver	11.4	4.0	5.1
Houston	2.5	8.3	5.8
Dallas/Ft. Worth	4.9	10.4	7.5
Chicago	6.6	8.0	6.0
Minn./St. Paul	4.2	7.1	4.2
Cleveland	2.3	14.7	2.9
Cin./Columbus	1.9	5.6	7.8
Detroit	6.4	3.6	4.9
St. Louis	12.8	3.2	6.5
Seattle	6.7	1.3	2.5
San Francisco	6.1	9.3	5.0
Los Angeles	7.5	11.1	13.9
Total Sample	7.1	8.8	9.1

FIGURE 3 **Average Salary by Region (in $)**

	ALL	BOSTON	MANHAT	NYC AREA	PHILA	WASH/ BALT	ATLANTA
CORPORATE STAFF							
■ Vice President	61,505	75,000	99,999	66,938	65,000	51,875	54,260
■ Director of Dp/MIS	49,754	57,019	63,667	57,471	51,032	54,277	46,310
■ Technical Services Manager	47,450	47,500	90,000	48,111	43,307	48,591	50,200
■ Information Center/Data Center Manager	41,029	50,667	NA	43,917	35,000	44,060	45,967
■ Director of Security	45,026	NA	NA	NA	NA	46,250	39,300
SYSTEMS ANALYSIS							
■ Manager	44,505	52,000	40,000	51,000	42,733	46,667	36,333
■ Senior Systems Analyst	38,852	45,667	35,000	38,667	41,000	46,713	44,000
■ Lead Systems Analyst	36,381	44,750	53,800	35,000	40,560	41,200	46,000
■ Systems Analyst	32,197	35,600	NA	36,000	37,000	34,643	36,625
■ Junior Systems Analyst	26,003	27,750	NA	28,500	NA	29,200	28,000
APPLICATIONS PROGRAMMING							
■ Manager	43,753	44,125	50,000	44,100	53,333	51,000	49,250
■ Lead Application Programmer	34,003	28,350	45,000	36,333	43,500	41,717	33,750
■ Senior Application Programmer	31,856	25,026	NA	33,900	38,250	39,333	31,100
■ Application Programmer	25,926	23,492	28,000	28,900	29,000	32,038	25,867
■ Intermediate Application Programmer	23,495	18,010	NA	25,000	24,000	29,200	31,000
■ Junior Application Programmer	20,410	16,406	NA	21,833	28,000	23,167	21,500
SYSTEMS ANALYSIS/PROGRAMMING							
■ Manager	44,229	47,975	65,000	47,250	46,090	50,630	44,500
■ Lead Systems Analyst/Programmer	36,545	29,260	NA	39,750	41,970	46,675	31,883
■ Senior Systems Analyst/Programmer	33,514	24,461	36,000	34,129	31,620	38,000	35,817
■ Systems Analyst/Programmer	29,854	25,505	NA	31,650	31,363	31,650	30,606
■ Intermediate Systems Analyst/Programmer	25,632	17,276	NA	28,890	26,600	28,965	23,538
■ Junior Systems Analyst/Programmer	22,021	23,450	NA	25,367	24,750	21,177	20,100
OPERATING SYSTEMS PROGRAMMING							
■ Manager	48,453	58,300	62,500	NA	47,000	52,667	46,675
■ Senior Systems Programmer	40,773	43,825	51,000	34,500	39,965	44,856	41,931
■ Intermediate Systems Programmer	33,006	40,500	NA	33,500	NA	35,653	31,013
■ Junior Systems Programmer	27,693	29,975	28,000	NA	NA	27,250	22,675
DATABASE ADMINISTRATION							
■ Manager	47,255	51,500	65,000	44,000	48,843	46,800	33,100
■ Database Administrator	37,357	47,000	51,000	NA	25,200	39,500	37,250
DATACOM/TELECOM							
■ Manager	45,417	51,500	50,000	42,000	NA	42,840	42,000
■ Analyst	33,087	39,000	20,000	37,500	NA	41,600	37,000
COMPUTER OPERATIONS							
■ Manager	32,958	31,800	44,000	28,750	42,520	45,219	30,100
■ Shift Supervisor	26,236	24,934	25,000	26,000	33,500	32,000	29,667
■ Lead Computer Operator	20,563	19,991	NA	22,167	23,122	25,776	21,467
■ Computer Operator	17,699	15,831	18,000	19,068	20,075	20,339	16,923
■ Magnetic Media Librarian	15,753	10,008	14,000	18,000	NA	28,000	18,000
PRODUCTION AND I/O CONTROL							
■ Supervisor	28,499	36,500	32,000	28,000	NA	29,120	25,400
■ Lead Production Controller	24,309	25,000	50,000	25,000	16,200	26,667	29,000
■ Scheduler	21,814	35,000	22,000	16,000	NA	26,500	19,580
■ Control Clerk	16,359	20,000	NA	13,580	17,400	20,450	16,446
DATA ENTRY							
■ Supervisor	20,720	22,400	30,000	26,400	24,959	22,346	16,737
■ Operator	14,958	16,617	17,000	14,917	16,064	15,447	13,995
OFFICE AUTOMATION							
■ Word Processing Supervisor	24,144	21,000	NA	35,000	22,460	31,000	35,000
■ Word Processing Operator	15,495	15,167	NA	25,000	14,867	19,728	13,625
■ Microcomputer User Services Specialist	27,578	NA	NA	34,000	31,002	26,865	32,117
DOCUMENTATION							
■ Specialists	23,707	22,750	NA	31,500	25,667	36,000	24,000
■ Consultant	43,512	NA	50,000	NA	64,000	55,000	46,125
■ Pc Evaluator	29,739	26,000	NA	25,000	NA	50,000	45,000

HOUS-TON	DENVER	DALLAS	CHI	MINN/ST. PL	CLEVE	CIN/COL	DTRT	ST. LOU	SEATL	SAN FRAN	LOS ANGEL
64,000	51,500	67,000	69,750	74,300	99,000	71,000	60,000	99,999	NA	56,333	65,343
63,025	37,900	50,667	54,458	56,271	72,500	47,714	51,332	50,286	50,443	65,520	55,282
58,000	30,000	55,252	44,714	50,380	75,000	48,500	43,000	48,500	NA	NA	50,000
40,000	32,000	36,076	51,857	50,292	31,384	35,000	NA	39,500	39,850	39,667	39,500
NA	NA	32,500	67,000	35,550	75,000	NA	NA	48,000	NA	NA	40,000
48,500	NA	NA	45,333	41,000	75,000	45,500	45,195	NA	NA	56,333	46,500
41,833	25,500	48,800	39,000	37,500	49,250	20,000	39,138	35,000	39,000	33,000	42,371
NA	NA	38,000	NA	31,667	45,000	35,000	32,500	NA	NA	NA	NA
32,000	NA	32,750	31,894	29,667	35,000	31,500	33,530	21,000	NA	35,000	38,600
30,000	NA	NA	25,500	23,500	28,000	NA	NA	NA	NA	NA	24,000
44,750	NA	45,250	39,750	42,000	41,867	39,000	44,276	38,000	48,376	62,000	37,500
43,200	NA	30,000	36,500	34,333	NA	26,500	36,406	NA	45,000	NA	41,000
37,700	26,400	25,000	35,000	32,674	24,000	28,000	35,302	35,000	38,000	32,750	32,500
32,067	26,033	24,000	26,300	29,500	22,750	24,083	31,000	23,000	28,967	34,250	27,000
NA	24,300	26,400	24,000	25,500	NA	NA	29,198	18,000	NA	33,125	29,333
NA	NA	NA	26,000	21,000	NA	18,500	26,403	20,000	22,435	NA	23,750
52,500	42,500	48,200	45,638	44,820	NA	NA	40,000	38,067	32,618	45,125	49,375
43,500	42,000	42,000	41,600	37,739	NA	37,333	NA	41,000	NA	45,004	45,500
37,000	32,750	38,076	36,188	33,793	NA	32,750	33,750	43,500	36,000	35,000	35,267
30,000	32,000	30,606	29,455	32,600	28,000	26,000	27,750	26,650	28,427	32,167	36,120
26,000	NA	NA	29,625	29,263	25,000	NA	24,750	26,000	26,640	NA	30,450
NA	24,500	26,250	26,140	22,540	NA	NA	NA	24,500	NA	NA	23,250
40,000	50,000	56,785	54,225	43,335	75,000	NA	NA	50,000	29,082	56,000	55,833
37,000	32,000	47,050	41,667	46,440	NA	33,000	45,000	42,750	NA	35,000	46,800
30,000	37,000	42,050	30,833	39,856	NA	26,000	28,000	31,333	25,121	30,000	48,000
NA	20,400	35,762	26,417	28,887	NA	NA	25,000	NA	NA	25,000	32,000
NA	NA	NA	44,450	48,000	28,000	37,000	NA	NA	NA	52,500	56,000
NA	28,500	NA	35,200	40,925	NA	NA	NA	30,000	39,500	32,000	41,000
60,000	NA	42,000	57,300	44,015	NA	40,000	52,000	45,000	25,000	55,000	50,333
38,000	26,500	39,003	40,750	31,250	NA	22,000	28,079	29,000	NA	30,000	31,000
29,750	32,000	32,750	33,885	37,483	38,500	36,667	29,851	48,000	31,626	43,448	38,727
28,000	30,000	22,500	28,500	30,073	NA	22,333	NA	28,233	27,444	25,750	28,617
26,333	22,738	19,462	21,580	24,256	20,000	21,000	19,251	22,320	18,980	21,569	21,844
24,000	17,767	17,750	18,907	18,693	16,283	16,710	16,063	16,771	22,055	21,821	21,606
NA	NA	18,200	13,100	16,500	NA	NA	NA	15,000	15,528	NA	NA
36,750	28,000	26,360	55,600	38,268	NA	29,500	25,000	26,000	NA	36,000	29,000
24,000	25,000	25,900	17,500	24,258	NA	NA	NA	25,000	NA	NA	NA
20,000	22,000	22,880	NA	26,750	NA	26,000	12,000	NA	16,334	NA	26,000
NA	19,000	13,236	15,333	22,581	NA	NA	20,074	19,083	NA	15,120	19,467
20,500	NA	26,484	22,000	31,741	25,000	17,000	20,820	22,167	20,198	17,050	23,600
19,000	16,722	15,848	16,690	15,772	14,100	15,250	15,562	17,813	16,193	17,667	16,589
NA	NA	35,452	23,167	24,659	NA	19,750	19,600	16,000	19,500	27,000	31,000
14,000	NA	15,300	14,833	17,467	14,000	16,000	13,750	13,500	13,250	19,200	19,000
38,000	22,750	36,367	18,833	NA	NA	NA	29,967	36,000	NA	26,000	27,000
27,000	25,500	22,250	30,000	NA	NA	10,000	NA	18,000	NA	18,000	37,250
40,000	38,500	34,152	50,000	NA	NA	NA	NA	NA	15,418	48,000	27,500
NA	NA	31,774	39,733	23,000	NA	NA	NA	15,000	27,000	NA	25,000

FIGURE 4 **Average Salary by Industry (in $)**

	ALL	CONSUM MFG	INDUS MFG	BANK	FINAN	DP SERV	OTHER SERV
CORPORATE STAFF							
■ Vice President	61,505	64,500	82,500	54,406	64,367	60,059	64,167
■ Director of Dp/MIS	49,754	51,814	50,828	59,900	51,254	54,219	45,043
■ Technical Services Manager	47,450	49,789	48,317	50,429	52,378	51,050	NA
■ Information Center/Data Center Manager	41,029	42,211	41,586	52,463	37,630	50,000	43,000
■ Director of Security	45,026	43,033	38,000	50,000	33,750	45,000	NA
SYSTEMS ANALYSIS							
■ Manager	44,505	40,400	45,609	37,098	46,000	44,300	45,000
■ Senior Systems Analyst	38,852	34,333	39,761	34,077	37,980	38,643	39,000
■ Lead Systems Analyst	36,381	41,933	35,927	36,250	28,500	40,600	NA
■ Systems Analyst	32,197	32,250	31,900	25,194	28,840	33,111	30,500
■ Junior Systems Analyst	26,003	25,000	26,000	25,545	26,500	27,000	NA
APPLICATIONS PROGRAMMING							
■ Manager	43,753	44,330	43,517	42,860	40,679	46,900	36,000
■ Lead Application Programmer	34,003	31,011	37,190	35,333	33,400	39,167	34,000
■ Senior Application Programmer	31,856	28,933	33,001	34,625	29,500	32,904	26,250
■ Application Programmer	25,926	26,546	26,533	23,063	24,558	28,344	24,198
■ Intermediate Application Programmer	23,495	22,500	23,983	23,333	23,250	26,400	20,580
■ Junior Application Programmer	20,410	16,833	22,756	21,500	20,000	20,936	30,000
SYSTEMS ANALYSIS/PROGRAMMING							
■ Manager	44,229	41,618	43,204	49,422	51,567	47,750	40,500
■ Lead Systems Analyst/Programmer	36,545	33,646	37,548	39,263	42,875	55,000	34,500
■ Senior Systems Analyst/Programmer	33,514	31,022	35,105	32,892	31,460	38,444	31,360
■ Systems Analyst/Programmer	29,854	26,967	31,730	27,725	28,444	32,117	27,667
■ Intermediate Systems Analyst/Programmer	25,632	26,983	26,037	25,248	27,350	25,286	23,000
■ Junior Systems Analyst/Programmer	22,021	22,311	21,611	21,330	25,500	24,375	NA
OPERATING SYSTEMS PROGRAMMING							
■ Manager	48,453	49,256	45,090	51,813	58,118	50,000	50,000
■ Senior Systems Programmer	40,773	40,310	41,154	38,514	44,171	43,500	36,750
■ Intermediate Systems Programmer	33,006	31,354	30,792	31,011	39,000	35,833	37,000
■ Junior Systems Programmer	27,693	25,238	28,258	28,000	30,671	23,500	NA
DATABASE ADMINISTRATION							
■ Manager	47,255	46,243	49,414	52,000	48,000	52,500	NA
■ Database Administrator	36,818	32,356	34,778	44,304	47,500	40,286	36,000
DATACOM/TELECOM							
■ Manager	45,417	50,675	54,787	42,978	42,250	46,250	NA
■ Analyst	33,087	30,700	33,167	26,899	33,784	35,200	31,000
COMPUTER OPERATIONS							
■ Manager	32,958	33,288	34,216	33,908	31,370	36,000	32,167
■ Shift Supervisor	26,236	29,475	29,080	23,069	25,600	31,000	30,000
■ Lead Computer Operator	20,563	20,470	20,818	18,114	19,457	25,286	20,511
■ Computer Operator	17,699	18,490	18,724	14,681	17,210	20,222	19,589
■ Magnetic Media Librarian	15,753	14,000	16,500	14,167	17,900	22,500	NA
PRODUCTION AND I/O CONTROL							
■ Supervisor	28,499	28,000	34,007	38,070	30,270	32,400	28,000
■ Lead Production Controller	24,309	21,250	22,243	28,021	29,760	32,000	25,000
■ Scheduler	21,814	20,333	16,000	30,355	23,376	27,333	22,000
■ Control Clerk	16,359	16,719	17,269	14,113	15,559	19,000	16,500
DATA ENTRY							
■ Supervisor	20,720	20,153	21,112	20,268	23,771	22,953	16,500
■ Operator	14,958	14,915	15,867	12,905	15,547	17,042	17,000
OFFICE AUTOMATION							
■ Word Processing Supervisor	24,144	24,189	25,980	24,500	25,804	30,800	NA
■ Word Processing Operator	15,495	15,711	16,367	10,750	16,929	16,627	NA
■ Microcomputer User Services Specialist	27,578	28,125	33,000	24,300	31,475	30,000	34,000
DOCUMENTATION							
■ Specialists	23,707	23,400	22,900	21,103	20,870	28,500	19,000
■ Consultant	43,512	38,000	NA	30,000	34,152	52,500	49,500
■ Pc Evaluator	29,739	NA	28,000	29,100	23,399	41,000	25,000

DISTRB	GOVT	MED/ LEGAL	TRANS/ UTIL	EDUCA	ANNUAL SPENDING	
					< $1 MIL	> $1 MIL
61,708	37,700	48,633	72,500	46,000	51,271	71,803
50,058	44,951	45,054	49,083	41,528	44,503	58,653
43,167	43,983	41,000	51,875	36,775	41,159	49,646
39,629	33,550	36,260	44,875	37,451	37,209	44,251
NA	75,000	NA	40,000	25,950	46,750	42,464
52,500	43,257	25,000	47,600	38,750	39,472	48,459
36,250	40,095	32,500	39,833	28,800	35,727	40,960
30,000	35,700	NA	37,500	20,000	32,654	38,400
33,000	32,734	35,500	33,000	31,600	30,793	33,333
NA	27,389	NA	26,000	28,000	25,427	26,419
57,500	44,110	32,250	53,000	30,584	41,673	44,749
30,508	37,846	24,000	29,130	27,667	30,769	35,568
29,016	35,071	30,530	25,311	27,880	29,327	34,061
26,875	28,348	22,675	21,488	23,307	24,819	27,298
15,300	27,733	18,500	18,010	23,257	22,406	24,352
17,274	22,343	19,600	13,674	19,232	20,680	20,233
36,750	35,817	35,613	44,600	45,084	38,256	48,454
39,320	32,978	22,000	33,262	31,507	33,211	39,787
35,167	31,324	31,000	31,309	28,804	31,970	35,161
29,833	25,493	27,500	26,605	27,751	28,480	30,912
24,000	24,585	23,000	20,507	23,628	24,401	26,345
17,567	17,493	NA	23,400	21,124	20,316	23,386
42,500	31,760	39,000	50,000	37,416	36,756	50,876
36,500	38,591	31,200	41,720	35,196	39,099	41,300
30,000	29,384	28,000	37,500	26,029	31,600	33,292
20,000	26,077	22,500	33,533	27,233	26,108	28,444
51,000	43,600	18,000	53,467	30,650	35,600	50,393
37,250	35,389	40,500	38,560	36,100	33,393	37,959
31,500	40,733	32,000	50,000	33,000	41,171	45,876
NA	32,040	NA	36,000	NA	31,833	33,101
26,111	36,646	27,083	31,755	29,824	28,469	36,500
23,250	25,176	19,750	26,679	23,631	25,389	26,705
19,001	21,169	19,082	21,828	17,822	19,348	22,162
16,639	17,254	15,835	18,780	16,452	16,824	18,877
17,000	15,000	NA	12,005	12,764	22,000	15,254
25,000	24,574	20,225	33,000	21,000	25,067	29,704
19,000	28,000	20,000	NA	15,333	22,417	24,849
18,000	21,075	NA	26,000	17,411	20,400	22,167
15,500	17,089	15,500	24,000	15,467	15,775	16,578
20,200	18,152	19,767	21,250	15,599	18,837	22,623
14,351	14,293	13,534	17,900	13,013	14,766	15,404
NA	17,931	27,500	19,000	NA	22,825	25,094
13,756	14,525	17,167	16,500	20,000	14,870	16,485
23,000	28,009	31,226	21,000	23,006	27,529	27,787
19,000	NA	14,800	NA	28,000	19,693	25,715
25,000	40,000	30,000	65,000	23,934	48,214	37,902
27,000	21,005	NA	50,000	18,000	26,225	30,617

jobs and not enough people."

For other jobs in other places, there are plenty of people. Foulds of St. Anthony's Hospital told DATAMATION that he has just finished hiring an operations manager. "We put the ad in the paper just locally and I must have gotten at least 80 résumés." Foulds says that most of the applicants already had jobs.

He points up one constant in the salary data: some industries pay a lot better than others. "The hospital pay rate for dp people is a tad bit lower than in general manufacturing," he says. Indeed it is. Looking at the 47 job titles surveyed, in 13 job positions the lowest average salaries were found in education. In nine positions, the lowest average salaries were in the medical or legal fields. Government pays the lowest average in six job positions. Banking is lowest payer in six others. The bottom payers in the other 13 positions were split between transportation with six; distribution with four; consumer manufacturing with two; and industrial manufacturing with one.

The survey revealed that perks remain important in the overall scheme, with some improvement in their availability from previous years. Almost 95% of all IS workers are covered for medical and dental expenses and get paid vacations. Almost 90% get company-provided life insurance, and are eligible for company disability and pension plans. About 60% get overtime pay. A significant change in the results of this year's survey is found in the response to questions about profit sharing and investment plans: in the 1986 survey, only about 40% of the companies sampled offered these incentives; this year, almost 90% offer investment plans and more than 70% offer profit sharing.

A striking difference in this year's sample is in the average number of full-time employees in MIS departments. In last year's survey, the average was 65.6; in this year's it is 78.3. Foulds at St. Anthony's reports that his staff grew last year because the hospital had gotten rid of a facilities management team and replaced independent contractors with full-time employees. "The hospital wanted to take internal control of its data processing," he explains.

Foulds is not the only MIS chief to replace temporary employees with full-time employees. This trend was one of the most vividly apparent in this year's survey. In last year's survey, managers reported that in 1985 they had employed an average of 11.5 temporary employees per site. For 1986, they didn't plan much

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change, predicting they'd have used 11.6 temporary employees by year's end. But the 1986 survey showed that each sampled site had actually averaged 7.6 temps, more than a third fewer temporary employees than had been reported in last year's survey. Forecasts for 1987's total—8.6 per site—are a bit up from this year, but still nowhere near the 1985 high point.

Some of this shift may be due to managers seeking—like Foulds—to "take control" of their staffs. But Joe Mohen, who runs Teleprocessing Conection, a small, five-person firm in Garden City, N.Y., that specializes in LU 6.2 implementation, says the Tax Reform Act is to blame. Section 1706 of the reform bill effectively removed the "safe harbor" in which so-called independent contractors were able to shelter some tax advantages over their salaried coworkers.

"An element of risk is perceived," says Mohen. "If you utilize temporary help from a small contracting firm, you now must fear that the independent contractors could be deemed your own common-law employees, the IRS holding you retroactively responsible for the personal income tax payments. It is only going to get worse. The Pandora's box of IRS witch-hunts has been opened."

George Werner, owner of GMW Associates in New York, a company that used to supply independent contract workers to IS operations, thinks some of the drop in temporary workers is due to business conditions. "When the banks took write-offs for bad debts, they cut costs. When people cut back, the first to go are independent contractors." But Werner adds that many IS people who once sold their services as independent contractors are now taking full-time jobs with primary employers.

One final note. If you're thinking of looking for big bucks as a high-tech exec, this might not be the year to move: according to the National Index of Executive Vacancies released by Korn/Ferry International, a New York executive search firm, high-technology hiring at the upper levels is down slightly from last year. In the survey released in late July, executive demand at technology companies accounted for 13% of total national executive demand; last year at this time, high technology accounted for 14% of demand. ■

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DATAMATION

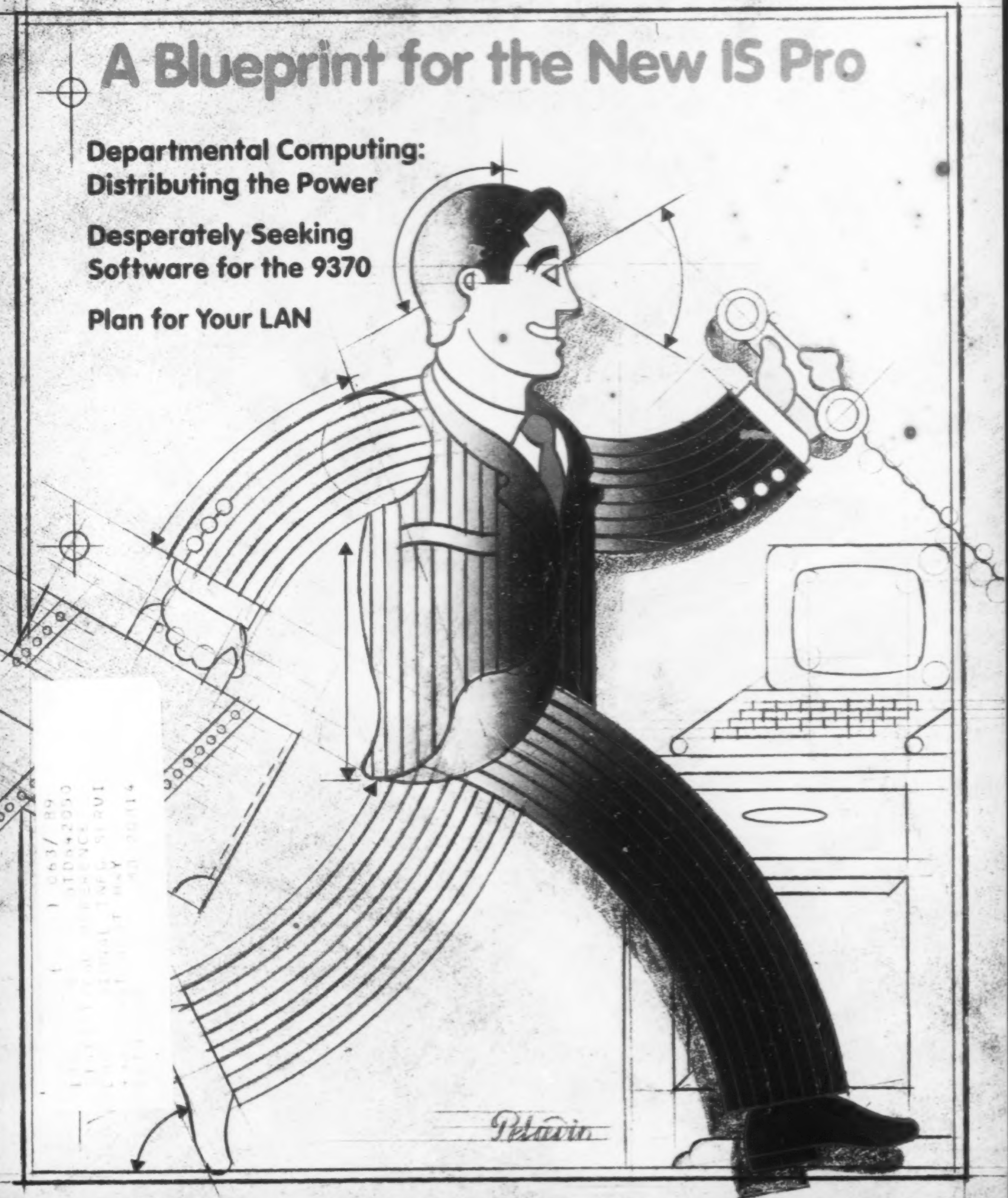
OCTOBER 15, 1987
A CAHNERS PUBLICATION

A Blueprint for the New IS Pro

Departmental Computing: Distributing the Power

Desperately Seeking Software for the 9370

Plan for Your LAN



DATAMAT

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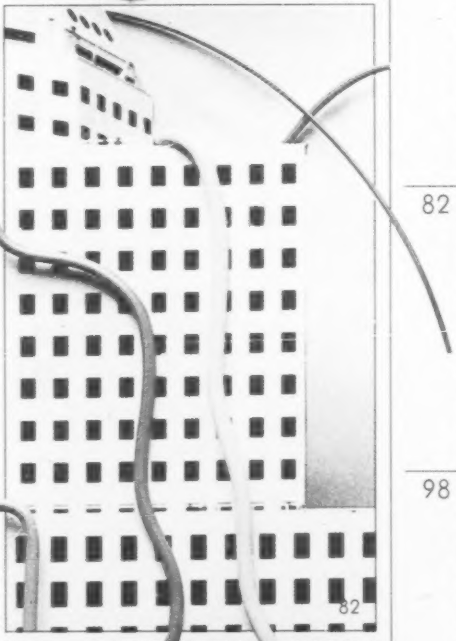

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Cover Illustration by Daniel Pelavin

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1987 JESSE H. NEAL AWARD

Editorial

Justice Is Served But Not So Competition

Customers of information technology and services have been dealt both a blow and a wild card in recent weeks—each in the name of competition. The blow came in the form of a U.S. district court ruling that limits the businesses regional Bell operating companies can enter. The one-eyed jack arrived from a more unlikely source—two arbitrators hired by IBM and Fujitsu to resolve their software copyright battle.

Why the BOCs can't manufacture equipment or pursue any other activity that free U.S. enterprises can is beyond us. In ruling last month that they couldn't offer long distance service and the like, Judge Harold H. Greene seemed to say he likes things as they were before the AT&T breakup: he's content to let Ameritech and the other BOCs be telephone companies—no more, but, unfortunately for their customers, a lot less.

The decision was hailed by several industry associations. For example, the Computer and Business Equipment Manufacturers Association, in Washington, D.C., says the decision reflects "a clear understanding of the need to preserve telecommunications competition." We think it merely protects some competitors. Perhaps such associations would do well to travel beyond the Potomac's lobbyist-lined banks to see how the rest of the world defines competition.

Now in the process of redefinition is competition in the mainframe arena, thanks largely to the rules and procedures (as well as penalty payments) ironed out last month by which Fujitsu and IBM can exchange data on mainframe operating systems. At first glance, the ruling seems to help users by enabling mainframe competitors such as Fujitsu to have access to IBM's designs. It's unclear, however, whether the security facilities where such data are to be exchanged are, in fact, feasible, or whether other IBM competitors will enjoy similar access.

These developments deserve your continued attention. If you, as customer of computer systems, want to ensure that you're getting the best possible solutions to your business problems at the best price, you ought to press for legislation or judicial action that will free the BOCs to serve you as best they can. Similarly, if you want to reap the full benefits of the mainframe competition implied in the arbitrators' ruling, you should see that the mechanisms set up for IBM and Fujitsu to exchange information are neither cumbersome nor closed to other vendors.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

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Letters

Secret No Longer

How gratifying to see coverage of the Pick operating system (July 15, p. 40). Edith D. Myers' illuminating article on Pick's performance in the Fortune 1000 market was long overdue.

As a leading training organization, JES & Associates Inc. has seen dozens of major companies using the Pick OS, among them Coca-Cola, Dow Chemical, Kodak, Lockheed, Sunkist, and Texaco.

For years, Pick was known as the "best kept secret" around; no longer. Thank you for letting the cat out of the bag.

JONATHAN E. SISK
JES & Associates Inc.
Irvine, California

Concept and Products

"IBM NetView Enhancements Stir Interest of MIS Shops" (Aug. 1, p. 19), was timely and relevant. It implied that NetView is today a lot of Fluff for the Future. Perhaps, but your perspective about NetView and Cincom's Net/Master is limited. NetView is two things. It is first a concept; second, it is a series of products.

As a concept, NetView is somewhat on target for IBM users. As a series of products, NetView is nothing new. The products that make up NetView are nothing new. Enhanced? Yes. But they are products that date back to the 1970s. Nor is NetView/PC even an IBM original. Avant Garde's Net/Command is merely one example of an implementation of NetView/PC.

Likewise, Cincom's Net/Master, mentioned in your article, fits well within the NetView concept. Rather than a "head-on competitor to NetView," Cincom views Net/Master as simply another "Focal Point" application that supports IBM's NetView concept. It's a cleaner, more productive, and efficient implementation of Netview than other older IBM products.

Nor had Cincom "bowed to IBM" when they announced support of NetView/PC. Rather, Cincom embraced NetView as an opportunity to support LANs and voice networks through a (de facto) standard. The world doesn't need another standard.

While NetView is an idea whose time has (finally) come, products like Net/Master will make it more feasible to implement. They will do this through a modern product set unavailable from IBM. IBM needs that reinforcement.

Competitive? No! Complementary? Yes!

THOM J. VOLLMAR
Marketing Product Manager
Cincom Systems Inc.
Cincinnati

Correction

Errors in the production process led to four photographs being miscaptioned in the Sept. 1 issue. We apologize for the mistakes. Here are the photographs with the correct captions.

Bruce Curry is director in charge, Computer Resources Dept., Peat, Marwick, Main and Co.

p. 17

Tosco Corp.'s Carl Peterson thinks NetView is "a repackaging of the existing products."

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At Samaritan Health Services, Robert McCrory manages a network that carries voice and data among four Phoenix hospitals.

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A standards engineer at Hewlett-Packard, Trudy Reusser founded ANSI's OSI committee.

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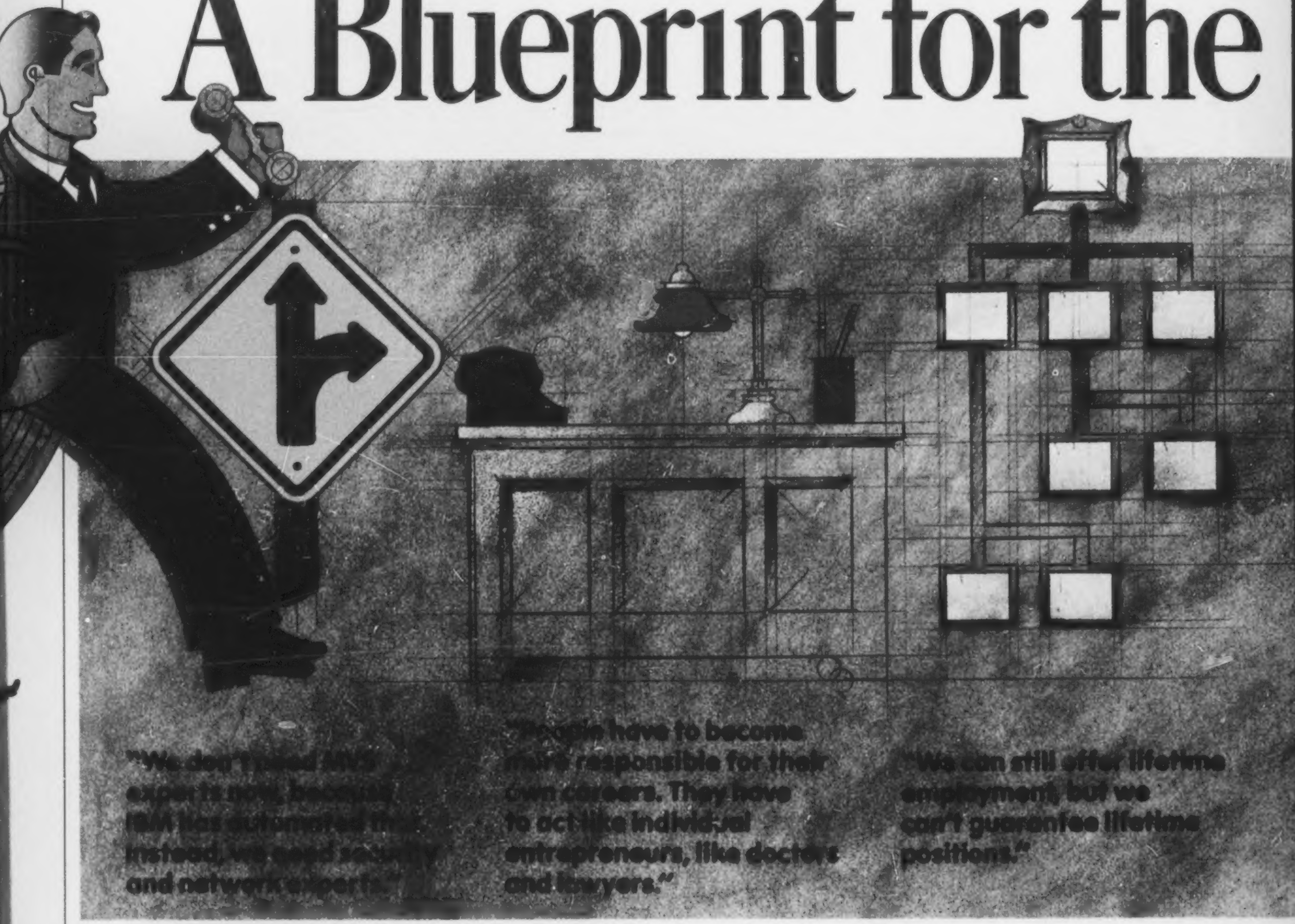
A Blueprint for the



"We don't need MVS experts now, because IBM has automated them. Instead, we need security and network experts."

"People have to become more responsible for their own careers. They have to act like individual entrepreneurs, like doctors and lawyers."

"We can still offer lifetime employment, but we can't guarantee lifetime positions."

A recent survey of Fortune 1000 executives indicates that as information technology becomes increasingly decentralized, the ability to adapt to new professional roles will displace sheer technical talent as the key to career success for IS practitioners. Adaptability, the ability to direct one's own career, and solid business skills are emerging as critical success factors.

BY CURT HARTOG AND
ROBERT A. ROUSE

To maintain their power and dominion, information systems pros are going to have to follow a new blueprint for success. While companies are slashing budgets in an effort to become leaner and meaner, end users are increasingly gaining control of applications and systems software. Corporations are responding by decentralizing their large IS staffs.

At the Center for the Study of Data Processing at Washington University in St. Louis, we conducted a national survey of 50 IS leaders—Fortune 1000 vice presidents, directors, and managers—to find out how they are adapting to the changing, decentralized IS environment (see "Sizing Up Your Staff").

As we talked with IS executives and examined the numbers from the survey, four themes stood out:

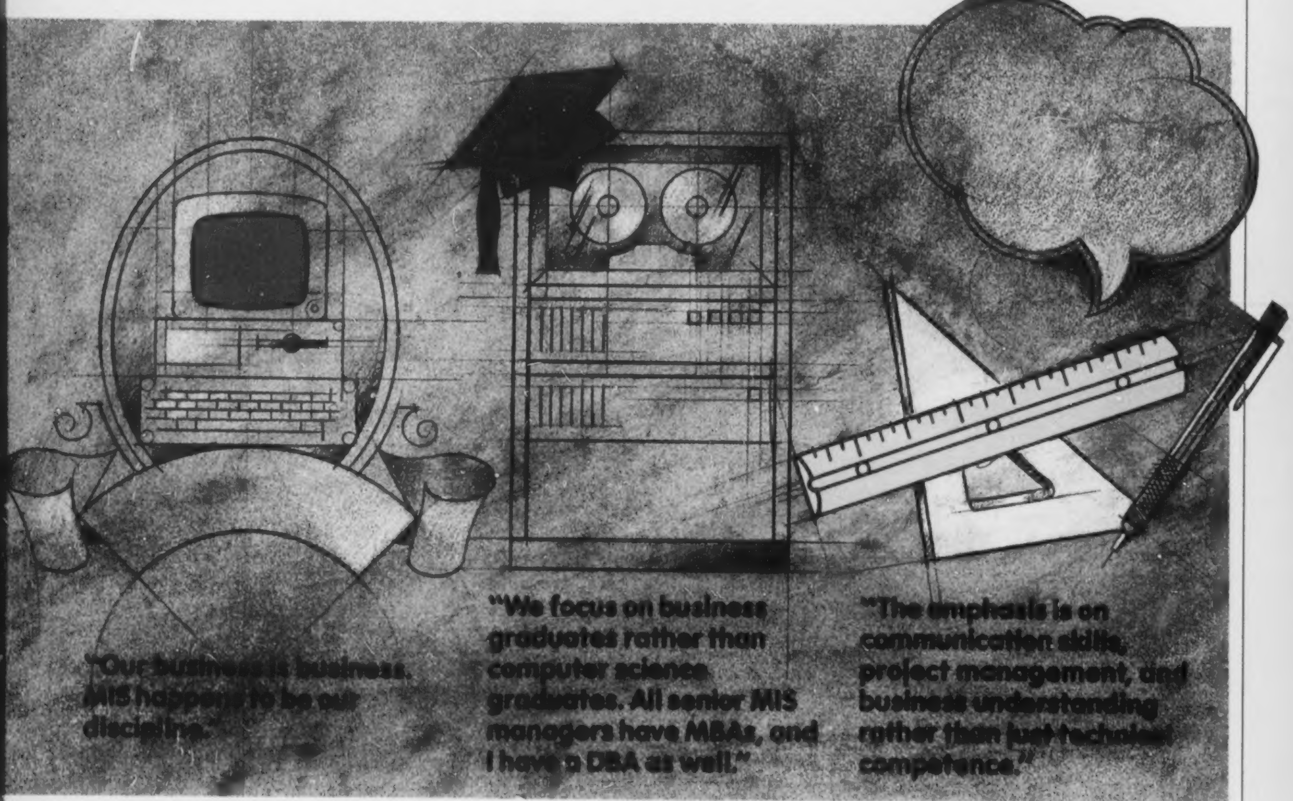
- IS jobs are undergoing fundamental changes,
- IS jobs increasingly are at risk,
- IS organizations are becoming more business oriented, and
- the responsibility for IS career development is falling increasingly upon the individual.

As IS professionals struggle to forge new identities in this changing environment (see "Battling for New Roles," Oct. 15, 1986, p. 82), adaptability, the ability to direct one's own career, and solid business skills are emerging as essential assets for survival. The ability to adapt to new professional roles is displacing sheer technical talent as the key to career success for IS executives and staffs.

For many in IS, early retirement and layoffs are sources of concern. For some, recent changes threaten their status as keepers of the technical flame. Unwilling to take seriously the growing dispersion and redefinition of information technology, they hold fast to skills that are becoming obsolete. Increasingly, they are becoming professionals at risk.

Herbert N. McCauley, vp of information management at Harris Corp. in

New IS Professional



"Our business is business. MIS happens to be our discipline."

"We focus on business graduates rather than computer science graduates. All senior MIS managers have MBAs, and I have a DBA as well."

"The emphasis is on communication skills, project management, and business understanding rather than just technical competence."

Illustration by Daniel Pelavin

Melbourne, Fla., observes growing resistance to change among IS practitioners. McCauley heads up the computer vendor's IS operation, which has an $80 million budget and a staff of 550. He feels that, despite increasing pressure to redefine their jobs, some IS professionals are clinging to technical skills that are no longer relevant. "We don't need MVS experts now," he explains, "because IBM has automated that. Instead, we need security and network experts."

MIS director Gerry Meier manages an IS staff of 55 and a budget of $4 million for Angelica Corp., a St. Louis uniform manufacturer. He believes that "some MIS people are finding it difficult to accept change because they identify themselves with existing technologies or procedures and have trouble letting go when a better product becomes available."

Becoming Outdated

Making the discovery that hard-won knowledge is now obsolete isn't easy for many dpers. Long the gurus of technology, some IS professionals are finding their own technical expertise lacking. Of the directors who responded to our survey, 12% indicated that the skills of their staffs were becoming outdated.

What used to be an IS monopoly is becoming a competitive information services market—both inside and outside the corporation—and customers are finding that they can avoid the IS backlog by shopping elsewhere. Savvy end users, frustrated by MIS procedures and services that they find too slow or too rigid, are taking IS matters into their own hands. Alternatives to slow IS applications development, such as improved off-the-shelf software and computer aided software engineering, are growing increasingly attractive.

A measure of the decentralization that is occurring is the movement of computing people and dollars outside of IS. Significantly, our respondents identified on average only 64% of the dollars spent on computing as direct IS budget items, a rough but startling indicator of change, especially when coupled with the fact that 18% of their IS staffs are working outside the department to support end-user computing. As budgetary control of computing slips away from the IS department, changes in IS roles will become more pronounced.

As technology moves out into the business functions, business concerns become more important to IS. Traditionally, IS priorities have placed the management of information technology first, and the management of people second. Too often, business has been a distant third. But IS executives are rethinking their priorities, as increased competition forces them to recognize the importance of a business orientation (see "Business Focus Is Key to Success," July 15, p. 47).

More than half of our survey respondents indicated that they are or would be requiring professionals who work for them to develop advanced business skills. As Ed Tenholder, vice president of national delivery systems at Blue

Cross and Blue Shield of Missouri, put it, "Our business is health care. MIS happens to be our discipline."

In some firms, the business perspective is quite emphatic. One executive surveyed wrote, "We focus on business graduates rather than computer science graduates. All senior MIS managers have MBAs, and I have a DBA [doctorate of business administration] as well.

"I look for communications skills even at the college trainee level. We've sent four MIS managers through executive MBA programs and have sent others to executive writing and interpersonal relations courses."

Another MIS director commented, "The emphasis is on communication skills, project management, and business understanding rather than just technical competence."

New Marketing Orientation

Marketing is an increasingly valuable business skill for those in IS to acquire. One IS executive who believes in a marketing orientation is Tenholder's boss, William Skowyra, senior vice president of Blue Cross and Blue Shield of Missouri (see "The MIS Marketeer"). Overseeing an IS budget of $22 million and a staff of 300 for the health care insurer, Skowyra has turned much of his resources to marketing policies. "We recognized that the customer was always right but that the end user wasn't always right," he explains. "We recognized who the real customer was."

The designers of information services will be brought into closer contact with customer needs as competitive pressures shift the nation toward a service economy. As those same customers become more computer savvy, telling them that something can't be done will become more difficult. Technical skills must be informed by an awareness of customers and markets, and IS professionals must not ignore the marketplace.

In this changing environment, who will acclimate the IS staff to this brave new world of business competition? As the old career track—from programmer to analyst to project leader—disappears, the responsibility of acquiring the necessary business skills and attitudes falls on the shoulders of the IS practitioner.

An overwhelming majority of respondents—87%—agreed that individuals are taking greater responsibility for their own careers. Interestingly, a large number of respondents—35 out of 46—also indicated that their companies support some form of career planning, a complementary, not contradictory, phenomenon. Companies no longer guide the individual at each step, but they do provide the map for planning the trip.

Harris's McCauley sums up: "People have to become much more responsible for their own careers. They have to act like individual entrepreneurs, like doctors and lawyers. We can provide the support in the form of training and education, but they have to chart the directions. I tell people we can still offer lifetime employment, but we can't guarantee lifetime positions."

The dynamics that drive businesses are having an increasing effect upon IS and its practitioners. As the competitive pressures and technological developments that are reshaping businesses also reshape the IS profession, adaptability, versatility, and self-reliance will become the IS professional's greatest assets. ■

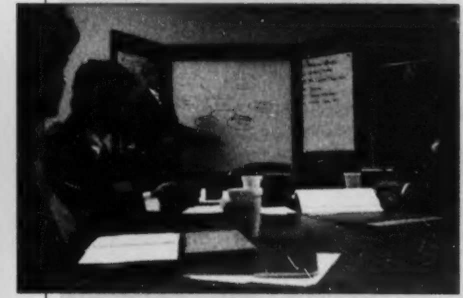
A frequent contributor to DATAMATION, Curt Hartog is an assistant director of the Center for the Study of Data Processing (CSDP) at Washington University in St. Louis. Robert A. Rouse is the associate director of the CSDP and the director of the newly formed Center for Intelligent Computer Systems, also at Washington University.

The MIS Marketeer

William Skowyra's management orientation at Blue Cross and Blue Shield of Missouri in St. Louis exemplifies the marriage of information technology and business.

As senior vice president of IS, he oversees a budget of $22 million and a staff of 300. He is credited with transforming a traditionally overloaded, fragmented dp shop into an aggressive marketing organization that uses technology as a vehicle for selling services to other Blue Cross and Blue Shield plans, as well as to national accounts.

In the early '80s when he was running the data center, Skowyra recognized the importance of servicing customer needs. Striving to draw in new business for the insurance conglomerate through improved customer service, he implemented a program that would consolidate claims processing on large, geographically dispersed accounts by using a single control plan. The plan enabled local Blue Cross and Blue Shield organizations to continue to provide the primary customer contact.



Blue Cross and Blue Shield's William Skowyra.

Eliminated were the customary delays that had occurred when information—in the form of data cards—was exchanged among participating plans. Also eliminated were business procedures that had become redundant, inefficient, or likely to alienate customers. Skowyra's innovations helped the company to retain a major account, while at the same time quickly elevating him to the top spot in the information systems realm.

Skowyra succeeded largely because he insisted that IS was a *business* function like any other department. As he puts it, "We didn't learn to say no. We learned to say yes." To turn his organization around, he began at the top, sending his four directors and, later, their functional managers to seminars on the health care industry. He also encouraged them to find customers and sell them policies.

Today, Skowyra's directors, like vp Ed Tenholder, spend as much as 40% of their time marketing Blue Cross and Blue Shield products and services. Skowyra practices what he preaches. By his own estimate, he spends 90% of his time marketing.

At a time when Blue Cross and Blue Shield is cutting staff, Skowyra's organization is growing. Tenholder will soon be adding marketing professionals to provide customer service and support. This blurring of organizational functions and the melding of professional objectives is eloquent testimony to the expanding potential of IS.

Sizing Up Your Staff

The Center for the Study of Data Processing at Washington University conducted a national survey of 50 IS execs on how they and their staffs are adapting to the changing IS environment. The following is a breakdown of the responses from the Fortune 1000 vps, directors, and managers.

Career Guidance

87%

report that their staffs are assuming increased responsibility for their own careers.

76%

report that their companies are providing career planning for individuals.

61%

report that their IS professionals are developing an entrepreneurial attitude.

78%

report that IS professionals are building personal/professional support networks.

Skills

12%

report that their staffs' skills are outdated.

70%

report that their staffs' skills are up to date.

83%

plan to retrain staff members.

80%

plan to upgrade the basic business skills of their staffs.

52%

plan to develop advanced business skills in their staffs.

83%

report that their companies support development of business perspectives and skills.

58%

report that their companies reward development of business perspectives and skills.

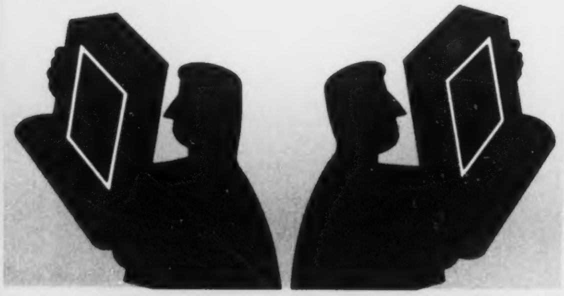
Decentralization

18%

report IS staff work outside the IS shop to support departmental computing.

64%

of total computing dollars are spent on direct IS budget items.



Jobs at Risk

11%

report frozen IS staff salaries.

36%

report layoffs or early retirement of IS employees.

30%

report IS jobs have been eliminated or left vacant.